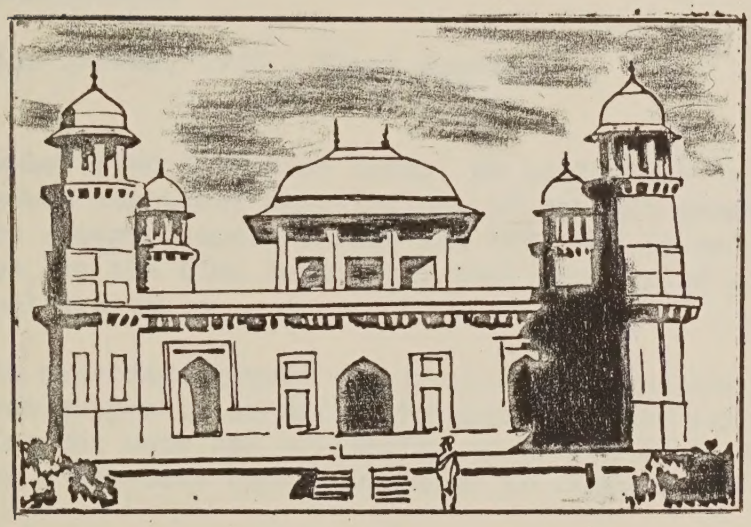
ADMINISTRATIVELY CONFIDENTIAL

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington



FOREIGN TRAVEL IN 1960

by

Samuel B. Detwiler, Jr.
Special Assistant to the Administrator, ARS

P. L. 480 Grant Negotiations in India
and Other Activities

Washington, D. C.
September 1961

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D. C.

April 25, 1962

TO: Guido E. Hilbert, Director, Foreign Research and Technical Programs Division

FROM: Samuel B. Detwiler, Jr., Special Assistant to the Administrator

SUBJECT: Foreign Travel, 1960 - Final Report

In November-December 1960 I visited India, on assignment to your Division, primarily to conduct technical negotiations of certain grants for agricultural utilization research under Public Law 480, and secondarily to take appropriate steps, in the time available, that would lead to the development of additional grants.

I was prepared to negotiate grants for 13 research projects developed by UR&D, largely from proposals submitted by Indian institutions. In some cases the idea for the work had originally come from UR&D; in other cases UR&D had prepared a complete counterproposal to replace the institution's proposal.

Grant negotiations were actually conducted for 9 of the 13 projects. Of the remainder, in two cases the institution proved unwilling to enter into negotiations for individual grants; in one case the principal investigator had left the institution; and in one case I was unable to visit the institution for lack of time. Of the nine grants negotiated, all have since become active grants, or are at the point of being activated. The following summary shows the action taken in 1960, and subsequent developments.

UR-A7-(00)-1(k)
Central Food Technological Research Institute, Mysore.
1960 action: Not negotiated; institution unwilling to accept individual grants.
Subsequent action: Project withdrawn by UR&D, June 1961.

UR-A7-(10)-2
Central Food Technological Research Institute, Mysore.
1960 action: Not negotiated; institution unwilling to accept individual grants.
Subsequent action: Project withdrawn by UR&D, June 1961.

UR-A7-(40)-3
University of Bombay.
1960 action: Grant negotiated.
Subsequent action: Grant accepted by grantee, 4/1/62.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D. C.

April 25, 1962

TO: Curtis E. Wilbert, Director, Foreign Research and Technical Programs Division

FROM: Samuel A. Cartwright, Jr., Special Assistant to the Administrator

SUBJECT: Foreign Travel, 1960 - Final Report

In November-December 1960 I visited India, at assignment to your Division, primarily to conduct technical negotiations of certain grants for agricultural utilization research under Public Law 480, and secondarily to take advantage of stops, in the time available, that would lead to the development of additional grants.

I was prepared to negotiate grants for 12 research projects developed by TAD, largely from proposals submitted by Indian institutions. In some cases the idea for the work had originally come from USDA; in other cases TAD had prepared a complete counterproposal to replace the institution's proposal.

Grant negotiations were actually conducted for 9 of the 12 projects. Of the remainder, in two cases the institution proved unwilling to enter into negotiations for individual grants; in one case the principal investigator had left the institution; and in one case I was unable to visit the institution for lack of time. Of the nine grants negotiated, all have since become active grants, or are at the point of being activated. The following summary shows the action taken in 1960, and subsequent developments.

US-A7-(10)-11(f)
Central Food Technological Research Institute, Mysore.
1960 action: Not negotiated; institution unwilling to accept individual grants.
Subsequent action: Project withdrawn by USDA, June 1961.

US-A7-(10)-2
Central Food Technological Research Institute, Mysore.
1960 action: Not negotiated; institution unwilling to accept individual grants.
Subsequent action: Project withdrawn by USDA, June 1961.

US-A7-(10)-3
University of Bombay.
1960 action: Grant negotiated.
Subsequent action: Grant accepted by grantee, 4/17/61.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D. C.

April 25, 1962

TO: Guido E. Hilbert, Director, Foreign Research and Technical Programs Division

FROM: Samuel B. Detwiler, Jr., Special Assistant to the Administrator

SUBJECT: Foreign Travel, 1960 - Final Report

In November-December 1960 I visited India, on assignment to your Division, primarily to conduct technical negotiations of certain grants for agricultural utilization research under Public Law 480, and secondarily to take appropriate steps, in the time available, that would lead to the development of additional grants.

I was prepared to negotiate grants for 13 research projects developed by UR&D, largely from proposals submitted by Indian institutions. In some cases the idea for the work had originally come from UR&D; in other cases UR&D had prepared a complete counterproposal to replace the institution's proposal.

Grant negotiations were actually conducted for 9 of the 13 projects. Of the remainder, in two cases the institution proved unwilling to enter into negotiations for individual grants; in one case the principal investigator had left the institution; and in one case I was unable to visit the institution for lack of time. Of the nine grants negotiated, all have since become active grants, or are at the point of being activated. The following summary shows the action taken in 1960, and subsequent developments.

UR-A7-(00)-1(k)
Central Food Technological Research Institute, Mysore.
1960 action: Not negotiated; institution unwilling to accept individual grants.
Subsequent action: Project withdrawn by UR&D, June 1961.

UR-A7-(10)-2
Central Food Technological Research Institute, Mysore.
1960 action: Not negotiated; institution unwilling to accept individual grants.
Subsequent action: Project withdrawn by UR&D, June 1961.

UR-A7-(40)-3
University of Bombay.
1960 action: Grant negotiated.
Subsequent action: Grant accepted by grantee, 4/1/62.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D. C.

April 25, 1962

TO: Guido E. Hilbert, Director, Foreign Research and Technical Programs Division

FROM: Samuel B. Detwiler, Jr., Special Assistant to the Administrator

SUBJECT: Foreign Travel, 1960 - Final Report

In November-December 1960 I visited India, on assignment to your Division, primarily to conduct technical negotiations of two grain grants for agricultural utilization research under Public Law 480, and secondarily to take appropriate steps, in the time available, that would lead to the development of additional grants.

I was prepared to negotiate grants for 12 research projects developed by PL 480, largely from proposals submitted by Indian institutions. In some cases the idea for the work had originally come from USDA; in other cases USDA had prepared a complete counterproposal to replace the institutional proposal.

Grant negotiations were actually conducted for 9 of the 12 projects. Of the remainder, in two cases the institutions proved unwilling to enter into negotiations for individual grants; in one case the principal investigator had left the institution; and in one case I was unable to visit the institution for lack of time. Of the nine grants negotiated, all have since become active grants, or are at the point of being activated. The following summary shows the action taken in 1960, and subsequent developments.

US-A7-(001-11W)
Central Food Technological Research Institute, Mysore.
1960 action: Not negotiated; institution unwilling to accept individual grants.
Subsequent action: Project withdrawn by USDA, June 1961.

US-A7-(10)-7
Central Food Technological Research Institute, Mysore.
1960 action: Not negotiated; institution unwilling to accept individual grants.
Subsequent action: Project withdrawn by USDA, June 1961.

US-A7-(20)-3
University of Bombay.
1960 action: Grant negotiated.
Subsequent action: Grant accepted by grantee, 4/1/62.

UR-A7-(60)-18
Central Leather Research Institute, Madras.
1960 action: Grant negotiated.
Subsequent action: Grant accepted by grantee, 10/16/61.

In the interests of further program development, I reviewed the research program under way at the institutions where grants were negotiated, and elsewhere as opportunity permitted, inspected the facilities available, and looked into the background and interests of key research investigators. Also, I carried with me a number of Research Problems, and offered them as appropriate. These Problems are merely formal expressions of research ideas developed by UR&D, consisting essentially of a title, plan of work, and brief technical justification. Their merit lies particularly in the fact that they have been precleared within UR&D and by other interested USDA agencies; thus they may be offered to institutions with assurance that, if accepted, they may be converted into grants with a minimum of hindrance.

At the institutions visited, it was appropriate to discuss about a dozen of the Problems. Of these, three were accepted and have moved forward to the grant negotiation stage; two others are moving forward favorably in the project stage; and four others are of interest to CFTRI and can probably be converted into grants when relations with that institution are re-established. Also, an informal Problem was developed on the spot in discussions at an institution, and the resulting project is now ready for grant negotiations.

A summary of my grant negotiation activities, addressed to Messrs. Henry Marston and Paul Oman and dated December 12, 1960, was prepared en route home. Reports of technical negotiation for nine projects were prepared subsequently, prior to or concurrently with clearance by the GOI (Damle) Committee of revised proposals submitted by the institutions. Also, I prepared the following nine travel reports, containing details of my activities and observations at the major institutions visited, and intended in large part for the information of UR&D staff members engaged in developing new program ideas for the institutions concerned:

1. General Observations.
2. University of Bombay, Bombay.
3. Kaira District Cooperative Milk Producers Union, Anand.
4. National Chemical Laboratory, Poona.
5. Indian Institute of Science, Bangalore.
6. Central Food Technological Research Institute, Mysore.
7. Central Leather Research Institute, Madras.
9. University of Allahabad, Allahabad.
10. National Dairy Research Institute.

I had projected the preparation of the following additional reports, concerned with conclusions and recommendations, and minor items of information acquired at or about sundry other institutions:

8. Madras University, Madras.
11. Miscellaneous Indian Institutions.
12. Conclusions and Recommendations.

13. Institute of Cotton Research and Technology, Karachi, Pakistan.
14. Punjab Agricultural College, Lyallpur, Pakistan.
15. ERRO, Rome.

Because of the press of regular duties in Washington, it has been impossible to prepare these latter reports. However, the matter is of no great consequence, inasmuch as the information to be contained therein has long since been conveyed by one means or another to the appropriate staff members of FRTPD and UR&D. The situation does serve to point up your own observation, that the foreign traveler would be well advised, when planning his itinerary, to allow enough time to prepare his reports before he returns home.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D.C.

February 14, 1961

TO: Guido E. Hilbert, Director, Foreign Research and Technical Programs Division

FROM: Samuel B. Detwiler, Jr., Special Assistant to the Administrator

SUBJECT: Foreign Travel, 1960 - Report No. 1
General Observations

During November and December, 1960, I served on detail to your Division, as the Utilization Research representative on a six-man team that visited India primarily to negotiate grants for agricultural research under U.S. Public Law 480. The other members of the team were Henry W. Marston, FRTPD (leader); Emmett R. DeMoss, ARS; Carl O. Erlanson, ARS; Harry A. Fowells, FS; and Bruce C. Strickler, FS.

I was prepared to negotiate grants for the 13 Research Projects listed in Attachment 1. These projects had been prepared and cleared within Utilization Research, and cleared as well by other interested Departmental research agencies and the Foreign Agricultural Service. Most of them had been developed from proposals previously submitted by the parent institution, although with more or less modification; indeed, one project (A7-12) represented a complete counterproposal to the institution's proposal. In one other case (A7-13) the project had been developed by Utilization Research without previous correspondence with the institution. And it should be noted that in two cases (A7-9, A7-10), the institution's proposal had been stimulated by an idea generated in Utilization Research and carried overseas by Sam R. Hoover during his India trip of 1959.

A key factor in the negotiation of grants was the decision, previously arrived at, that all P. L. 480 proposals submitted by Indian institutions should be cleared through a committee headed by Mr. K. R. Damle, Secretary of Agriculture. In this connection, the team attended a meeting of the Damle Committee on November 5--its first meeting since April 1960--with Mr. Marston acting as spokesman for the team. Mr. Marston pointed out that the proposals on the Committee's agenda did not include all for which I was expecting to negotiate grants; also, that even where the Committee

had received proposals for consideration, these had been more or less modified by us in the preparation of projects. Accordingly, Mr. Damle agreed that I might proceed with efforts to negotiate the 13 grants, with the stipulation that after negotiations, the parent institution would in each case prepare a revised proposal and forward it through the Committee for clearance. All of my negotiations, therefore, were conducted on a tentative basis.

Results of the negotiation activities are outlined in my memorandum of December 12, 1960, to Henry Marston in Washington and Paul Oman in New Delhi (Attachment 2). This shows that of the 13 projects, grants were tentatively negotiated for nine. Of the remainder, in two cases the institution proved unwilling to negotiate grants on an ad hoc basis; in one case, the principal investigator had left the institution and there appeared to be no other scientist who could carry on the work; and in one case, a visit to the institution could not be arranged in the time available, although I did meet the principal investigator in New Delhi and clear the plan of work with him.

Details of the negotiation activities will appear in a series of separate memoranda, concerned with the different institutions, that are now in preparation.

Mr. DeMoss accompanied me to the various institutions to handle the fiscal aspects of grant negotiations.

Another phase of my activities in India concerned the discussion of Research Problems at various institutions. These Research Problems are skeleton projects that had been prepared by Utilization Research with the idea that they might be offered to interested institutions as a basis for the development of research proposals. Their titles are listed in Attachment 3. Before I left Washington for India, most of them had been cleared in principle, not only within Utilization Research, but also with other interested research agencies and the Foreign Agricultural Service.

While in New Delhi, I was able to discuss these Research Problems with officials of the Council of Scientific and Industrial Research (Dr. H. A. B. Parpia, industrial liaison and extension officer, on November 8); the University Grants Commission (Dr. B. D. Laroia, development officer, and Dr. D. Shankar Narayan, assistant education officer, on November 9); and the Indian Council of Agricultural Research (Dr. M. S. Randhawa, vice-president, on November 8). All of these officials felt that the

had received proposals for consideration, these had been more or less modified by us in the preparation of projects. Accordingly, Mr. Damle agreed that I might proceed with efforts to negotiate the 13 grants, with the stipulation that after negotiations, the parent institution would in each case prepare a revised proposal and forward it through the Committee for clearance. All of my negotiations, therefore, were conducted on a tentative basis.

Results of the negotiation activities are outlined in my memorandum of December 12, 1960, to Henry Marston in Washington and Paul Oman in New Delhi (Attachment 2). This shows that of the 13 projects, grants were tentatively negotiated for nine. Of the remainder, in two cases the institution proved unwilling to negotiate grants on an ad hoc basis; in one case, the principal investigator had left the institution and there appeared to be no other scientist who could carry on the work; and in one case, a visit to the institution could not be arranged in the time available, although I did meet the principal investigator in New Delhi and clear the plan of work with him.

Details of the negotiation activities will appear in a series of separate memoranda, concerned with the different institutions, that are now in preparation.

Mr. DeMoss accompanied me to the various institutions to handle the fiscal aspects of grant negotiations.

Another phase of my activities in India concerned the discussion of Research Problems at various institutions. These Research Problems are skeleton projects that had been prepared by Utilization Research with the idea that they might be offered to interested institutions as a basis for the development of research proposals. Their titles are listed in Attachment 3. Before I left Washington for India, most of them had been cleared in principle, not only within Utilization Research, but also with other interested research agencies and the Foreign Agricultural Service.

While in New Delhi, I was able to discuss these Research Problems with officials of the Council of Scientific and Industrial Research (Dr. H. A. B. Parpia, industrial liaison and extension officer, on November 8); the University Grants Commission (Dr. B. D. Laroia, development officer, and Dr. D. Shankar Narayan, assistant education officer, on November 9); and the Indian Council of Agricultural Research (Dr. M. S. Randhawa, vice-president, on November 8). All of these officials felt that the

Research Problems constituted an excellent device for arriving at specific research subjects of mutual interest. Both Dr. Parpia and Dr. Laroia offered their views on institutions that might be qualified to undertake the Problems; their priorities are coded into Attachment 3. While Dr. Randhawa offered no advice on institutions, he did give particular endorsement to certain Problems, as indicated in Attachment 3.

I was able to make only a beginning in finding sponsors for the Research Problems, since (1) I visited only institutions where grant negotiations were in prospect, (2) the institutions were visited in order of geographical convenience, and (3) some institutions needed time for consideration of the Problems. However, there would appear to be opportunity for our Far Eastern Regional Research Office to follow up on this activity as time permits. It should be noted that some Problems were left for consideration at more than one institution; this arrangement was satisfactory to all concerned.

Results of operations with the Research Problems will be included in the separate memoranda previously referred to.

As opportunity permitted, I reviewed the programs and accomplishments of the institutions visited, inspected the research facilities, and talked with key research and administrative personnel.

Before I left New Delhi, Paul W. Oman, Elmore F. St. Clair, and Janet Newton arrived and established the Far Eastern Regional Research Office. I had several conversations with Messrs. Oman and St. Clair to keep them closely informed of my activities.

On leaving India, I stopped briefly in Karachi, Pakistan, where a visit was made to the Institute of Cotton Technology. While in Karachi I met Clyde W. Eddy, consultant to the Punjab Agricultural College at Lyallpur, and discussed ideas for possible P. L. 480 programs at that institution.

On leaving Pakistan I proceeded to Rome for a visit to the European Regional Office of FRTPD. Principal topic discussed was collaboration in the development of a technical information file on the interests and qualifications of foreign research workers and their institutions in countries of interest to the P.L. 480 program.

Institutions visited, or on which information was acquired, are listed in Attachment 4. My itinerary appears in Attachment 5.

At the Embassy in New Delhi, Horace J. Davis, agricultural attache, his associates Thomas E. Street and Elson R. Needles, Jr., and his secretary Zenobia Boyce, all were most cooperative and helpful in furnishing background information on Indian research institutions, arranging appointments in New Delhi, making travel arrangements, and providing secretarial service. Similar assistance was provided at Karachi by Donald L. MacDonald, agricultural attache, and at Rome by Messrs. Scott, Ayers, and Shabetai, Miss Williams, and others of the Regional Office staff.

Attachments

1. Utilization Research Projects Cleared for Grant Negotiations with Indian Institutions
2. Memo of 12/12/60, Detwiler to Marston and Oman
3. Research Problems
4. Institutions Visited, or on Which Information Was Acquired
5. Itinerary

Attachment 1

UTILIZATION RESEARCH PROJECTS CLEARED FOR GRANT NEGOTIATIONS WITH INDIAN INSTITUTIONS

UR-A7-(00)-1(k)
Chemical screening of lesser-known legumes of India by investigation of their seed protein content and amino acid composition, to provide information basic to development of new high-protein crops.
Central Food Technological Research Institute, Council of Scientific and Industrial Research, Mysore. Dr. V. Subrahmanyan, Director.
Principal Investigator: Dr. A. Sreenivasan, Deputy Director.
Duration: 5 years.

UR-A7-(10)-2
Fundamental and applied investigations on supplementation of cereal grains with oilseeds and legumes and their protein concentrates to improve the nutritional value of low-cost food combinations through a better balance of essential amino acids, as a basis for increasing the export of cereal grains.
Central Food Technological Research Institute, Council of Scientific and Industrial Research, Mysore. Dr. V. Subrahmanyan, Director.
Principal Investigator: Dr. A. Sreenivasan, Deputy Director.
Duration: 5 years.

UR-A7-(40)-3
A study of the relationship of substituent fatty acid groups to the physical properties of diacid triglycerides of palmitic and stearic acids, as a means of increasing the utilization of cottonseed oil for food and industrial purposes.
University of Bombay, Bombay. G. M. Nabar, Director, Chemical Technology Department.
Principal Investigator: D. Rebello, Ph.D.
Duration: 5 years.

UR-A7-(20)-4
Investigation of the photochemical degradation of cotton, to derive information which would enhance the utilization of cotton.
University of Bombay, Bombay. G. M. Nabar, Director, Chemical Technology Department.
Principal Investigator: E. H. Daruwalla, Ph.D.
Duration: 5 years.

UR-A7-(10)-7
Fundamental studies of enzyme systems isolated from Pseudomonas, to obtain information on the conversion of carbohydrates derived from cereal grains to organic acids having potential industrial value.
Indian Institute of Science, Bangalore. S. Bhagavantam, D.Sc., Director.
Principal Investigator: J. V. Bhat, Ph.D., Assistant Professor of Biochemistry, in charge of laboratory.
Duration: 5 years.

UR-A7-(10)-9
Collection and isolation of molds belonging to the order Mucorales, and classification of the isolates, in order to find microorganisms suitable for fermentative processes of importance in cereal grain utilization.
University of Allahabad, Allahabad.
Principal Investigator: B.S. Mehrotra, Ph.D., Assistant Professor of Botany.
Duration: 5 years.

UR-A7-(10)-10
A study of survival and possible genetic change in industrially useful microorganisms subjected to lyophilization, to obtain basic information needed for the maintenance of culture collections for industrial fermentation of cereal grains.
University of Allahabad, Allahabad.
Principal Investigator: B. S. Mehrotra, Ph.D., Assistant Professor of Botany.
Duration: 5 years.

UR-A7-(60)-11
Investigations of sulfur compounds in milk and milk products, and their relation to "cooked" flavors and oxidative stability, to obtain fundamental information needed in the preparation of high-quality, stable milk products.
National Dairy Research Institute, Karnal, Punjab. K. K. Iya, Ph.D., Director.
Principal Investigator: K. K. Iya.
Duration: 4 years.

UR-A7-(40)-12
Investigation of the effect of heat on tung oil and derivatives of tung oil, and the characterization and identification of compounds resulting from heat treatments, to extend the utilization of tung oil.
National Chemical Laboratory, Poona. Dr. K. Venkataraman, Director.
Principal Investigator:
Duration: 5 years.

UR-A7-(60)-13
Investigations of the addition of non-fat dry milk solids to buffalo milk in the manufacture of hard cheese, as a means of expanding overseas markets for dry milk.
Kaira District Cooperative Milk Producers Union, Ltd., Anand.
Principal Investigator: V. Kurien.
Duration: 3 years.

UR-A7-(10)-14
Electron microscope studies of the proteinaceous matrix in which starch granules are imbedded in the endosperm of wheat kernels, to obtain basic information needed for better milling separations to increase the utilization of wheat.
University of Allahabad, Allahabad.
Principal Investigator: Vishwambhar Dayal Gupta, Ph.D., Assistant Professor.
Duration: 5 years.

UR-A7-(60)-17
Studies on the mode of reaction of polyphenolic tanning compounds with hide proteins (collagen) to obtain fundamental information for developing heavy leather with improved properties.
Central Leather Research Institute, Madras.
Principal Investigator: Dr. Y. Nayudamma, Director of Institute.
Duration: 5 years.

UR-A7-(60)-18
Studies of the interrelation of hide quality with the rate of tanning and the efficiency of tanning, to obtain information for use in developing improved processes for making leather.
Central Leather Research Institute, Madras.
Principal Investigator: Dr. Y. Nayudamma, Director of Institute.
Duration: 5 years.

Attachment 2

TO: Henry W. Marston, FRTPD, Washington, D.C.
Paul W. Oman, RRO, New Delhi, India

Rome, Italy
December 12, 1960

FROM: Samuel B. Detwiler, Jr.

SUBJECT: Grant Negotiation Activities in India

Attached is a summary report of my activities in India during November and December, 1960, as concerns the negotiation of utilization research grants. A complete report will be contained in a series of memoranda addressed to Dr. Hilbert, to be prepared as soon as possible after my return to Washington.

Briefly, out of 13 projects that were ready for grant negotiations, nine were successfully negotiated; in one case, the plan of work was cleared with the institution, although cost figures could not be discussed; in one case, the principal investigator had left the institution to spend several years in the United States; and in two cases, the institution was unwilling to negotiate individual grants on an ad hoc basis.

Pursuant to Mr. Marston's agreement at the November 5 meeting of the Damle Committee, the grants were negotiated on a tentative basis. It was made clear to each institution that revised proposals should be prepared and submitted to the Committee for final clearance.

The titles in the attached statement are those of the Approval Copy of the Utilization Research projects. The institutions were asked, in preparing each revised proposal, to follow the language of the Approval Copy as concerns title and objective, and as concerns the plan of work except as modified during negotiations. In some cases, minor changes in the plan of work were tentatively agreed to, subject to clearance with Utilization Research in Washington.

The cost figures shown are those arrived at in the fiscal negotiations by Mr. DeMoss.

At certain institutions I reported on the status of sundry other proposals (going forward favorably, or dropped) that had come to the attention of Utilization Research in Washington.

I had some success in interesting various institutions in the Research Problems that we had developed in Washington prior to my trip, and it is probable that grants can be developed from several of them.

2- Henry W. Marston - 12/12/60
Paul W. Oman

As agreed with Dr. Oman, upon returning to Washington I shall supply him with a list of all Indian Research Proposals that have been considered by Utilization Research, together with copies of the original proposals, pertinent correspondence, Research Projects where these have been prepared, and an indication of status. Also, I shall supply him with a list of Research Problems and the action taken on each, if any.

Attachment

GRANT NEGOTIATION ACTIVITIES IN INDIA

BOMBAY: UNIVERSITY OF BOMBAY, DEPARTMENT OF CHEMICAL TECHNOLOGY

Dr. G. M. Nabar, Director
Visited November 14 - 15, 1960

UR-A7-(40)-3
A study of the relationship of substituent fatty acid groups to the physical properties of diacid triglycerides of palmitic and stearic acids, as a means of increasing the utilization of cottonseed oil for food and industrial purposes.

Principal Investigator: Dr. D. Rebello
Action: Successfully negotiated. Plan of Work to follow the Approval Copy of Research Project, with the following minor change: In last paragraph, first sentence, delete the phrase, 'smoke point, flash point, fire point.'
Negotiated cost: Rs 186,670.
Note: Before I left Delhi, I received from the University an information copy of its revised proposal. This appears to be entirely in order, and ready for recommendation of a grant as soon as cleared by the Damle Committee.

UR-A7-(20)-4
Investigation of the photochemical degradation of cotton, to derive information which would enhance the utilization of cotton.

Principal investigator: Dr. E. H. Daruwalla.
Action: Successfully negotiated. Plan of work to follow the Approval Copy of Research Project, with the following minor change: In second paragraph, delete the phrase, 'including chromatographic techniques'.
Negotiated cost: Rs 198,550.
Note: Before I left Delhi, I received from the University an information copy of its revised proposal. This appears to be entirely in order, and ready for recommendation of a grant as soon as cleared by the Damle Committee.

ANAND: KAIRA DISTRICT COOPERATIVE MILK PRODUCERS UNION

Mr. V. Kurien, General Manager
Visited November 16, 1960

UR-A7-(60)-13
Investigations of the addition of non-fat dry milk solids to buffalo milk in the manufacture of hard cheese, as a means of expanding overseas markets for dry milk.

Principal Investigator: Dr. H. M. Dalaya, Asst. Gen. Mgr.
Action: Successfully negotiated. Plan of work to follow the approval copy of Research Project, with the following changes: (1) In first sentence, delete 'Swiss' and insert 'other varieties'. (2) At end of the paragraph, add sentence, 'The addition of dry milk to processed cheese and cheese spreads will also be studied'. (3) Add a second paragraph, as follows: 'The foregoing operations

will be conducted chiefly on a small pilot-plant scale. If warranted by results of the pilot-scale work, several cheese-making operations may be conducted on lots of as much as 1,000 gallons of standardized milk; equipment and curing facilities for the latter operations are already available at the Kaira Cooperative.'

Negotiated cost: Rs 348,200.

POONA: NATIONAL CHEMICAL LABORATORY
Dr. K. Venkataraman, Director
Visited November 18-19, 1960

UR-A7-(40)-12

Investigation of the effect of heat on tung oil and derivatives of tung oil, and the characterization and identification of compounds resulting from heat treatments, to extend the utilization of tung oil.

Principal Investigator: Dr. Sukh Dev.

Action: Successfully negotiated. Plan of work to follow the Approval Copy of Research Project, verbatim.

Negotiated cost: Rs 242,500.

Note: This was a complete counterproposal to the institution's original proposal, which concerned a chemical engineering process study of the catalytic hydrogenolysis of fatty acid ethyl esters, and catalytic hydrogenation of unsaturated glycerides.

BANGALORE: INDIAN INSTITUTE OF SCIENCE
Dr. S. Bhagavantam, Director
Visited November 21, 1960

UR-A7-(10)-7

Fundamental studies of enzyme systems isolated from Pseudomonas, to obtain information on the conversion of carbohydrates derived from cereal grains to organic acids having potential industrial value.

Principal Investigator: Dr. J. V. Bhat.

Action: Successfully negotiated, with the proviso indicated below. Plan of work to follow the Approval Copy of Research Project, verbatim.

Negotiated cost: Rs 115,915.

Note: The plan of work as offered to Dr. Bhat cleared up one of his reservations, made last year when Dr. Hoover discussed a previous draft of the project with him. However, Dr. Bhat had another reservation, of which I had not previously been aware; namely, that although he considers himself competent in this field, and has a good collection of Pseudomonas organisms, he presently knows of no strain that is a good producer of alpha-ketoglutaric acid. It was left that he would spend from one to three months in screening his collection, to find a suitable producer; if he finds one, then the revised proposal will go forward. Meanwhile, I shall expect to find out whether the ARS Culture Collection can help in this connection.

3-Grant Negotiation Activities in India

MYSORE: CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE
Dr. V. Subrahmanyan, Director; Dr. A. Sreenivasan, Deputy Director
Visited November 23-24, 1960

UR-A7-(00)-1(k)
Chemical screening of lesser-known legumes of India by investigation of their seed protein content and amino acid composition, to provide information basic to development of new high-protein crops.

Principal investigator: Dr. A. Sreenivasan.

Action: Could not be negotiated. This project was the outgrowth of a proposal submitted by Dr. Sreenivasan while he was stationed at the University of Bombay, before coming to the CFTRI. I discussed the project with Dr. Sreenivasan when he visited Washington in September, 1960, and received his clearance of the plan of work. However, during my visit to Mysore, Director Subrahmanyan was unwilling to proceed with negotiations on the basis of individual grants. He felt that previous attempts at cooperation with American groups had gone forward too slowly (here he was referring to Wheat Associates, Dairy Science International, and the American Soybean Council); and he felt further that 'when dealing with institutions like ours, there should be a more broad-based and generous approach.' He could see no advantage in negotiating individual grants, in that CFTRI already had an ample rupee budget, and we had no foreign exchange to offer him. He did, however, suggest that it would be advantageous for us to give a blanket grant to the Council of Scientific and Industrial Research, under which manifold subprojects (of interest to both utilization research and marketing research) could be set up. He handed me a letter and a six-page statement outlining his position. I responded as concerns certain matters of fact, and promised that the policy considerations would be brought to Dr. Hilbert's attention immediately upon my return to Washington.

UR-A7-(10)-2
Fundamental and applied investigations on supplementation of cereal grains with oilseeds and legumes and their protein concentrates to improve the nutritional value of low-cost food combinations through a better balance of essential amino acids, as a basis for increasing the export of cereal grains.

Principal Investigator: Dr. A. Sreenivasan.

Action: Same comments as for UR-A7-(00)-1(k),above.

4-Grant Negotiation Activities in India

MADRAS: CENTRAL LEATHER RESEARCH INSTITUTE
Dr. Y. Nayudamma, Director
Visited November 25-26, 1960

UR-A7-(60)-17
Studies on the mode of reaction of polyphenolic tanning compounds with hide proteins (collagen) to obtain fundamental information for developing heavy leather with improved properties.
Principal Investigator: Dr. Y. Nayudamma.
Action: Successfully negotiated. Plan of work to follow the Approval Copy of Research Project, verbatim.
Negotiated cost: Rs 187,500.
Note: Before I left Delhi, I received from the Institute an information copy of its revised proposal, which had been sent to CSIR for transmittal to the Damle Committee. This appears to be entirely in order, and ready for recommendation of a grant as soon as cleared by the Committee.

UR-A7-(60)-18
Studies of the interrelation of hide quality with the rate of tanning and the efficiency of tanning, to obtain information for use in developing improved processes for making leather.
Principal Investigator: Dr. Y. Nayudamma.
Action: Successfully negotiated. Plan of work to follow the Approval Copy of Research Project, with the following change: At end of first paragraph, add the additional sentence, 'Based on these investigations, an attempt will be made to evolve a suitable but simple technique to determine the actual leather-making substance in the raw hide.'
Negotiated cost: Rs 121,500.
Note: Before I left Delhi, I received from the Institute an information copy of its revised proposal, which had been sent to CSIR for transmittal to the Damle Committee. This appears to be entirely in order, and ready for recommendation of a grant as soon as cleared by the Committee.

5-Grant Negotiation Activities in India

ALLAHABAD: UNIVERSITY OF ALLAHABAD
Dr. R. N. Tandon, Head of Botany Department
Visited December 1-2, 1960

UR-A7-(10)-9
Collection and isolation of molds belonging to the order Mucorales, and classification of the isolates, in order to find microorganisms suitable for fermentative processes of importance in cereal grain utilization.
Principal Investigator: Dr. B. S. Mehrotra.
Action: Successfully negotiated. Plan of work to follow the Approval Copy of Research Project, verbatim.
Negotiated cost: Rs 81,100.

UR-A7-(10)-10
A study of survival and possible genetic change in industrially useful microorganisms subjected to lyophilization, to obtain basic information needed for the maintenance of culture collections for industrial fermentation of cereal grains.
Principal Investigator: Dr. B. S. Mehrotra.
Action: Successfully negotiated. Plan of work to follow the Approval Copy of Research Project, verbatim.

UR-A7-(10)-14
Electron microscope studies of the proteinaceous matrix in which starch granules are imbedded in the endosperm of wheat kernels, to obtain basic information needed for better milling separations to increase the utilization of wheat.
Principal Investigator: Dr. V. D. Gupta (Physics Department).
Action: Not negotiated. I was advised that Dr. Gupta had gone to the Textile Research Institute at Princeton, where he expected to spend the next two or three years.

KARNAL: NATIONAL DAIRY RESEARCH INSTITUTE
Dr. K. K. Iya, Director

UR-A7-(60)-11
Investigations of sulfur compounds in milk and milk products, and their relation to 'cooked' flavors and oxidative stability, to obtain fundamental information needed in the preparation of high-quality, stable milk products.
Principal Investigator: Dr. K. K. Iya.
Action: Not negotiated, inasmuch as Dr. Iya was in Delhi during the only period when a visit to Karnal could have been arranged. However, I did hold informal discussions with Dr. Iya in Delhi, and cleared the plan of work of our project, which represented a counterproposal.

Attachment 3

RESEARCH PROBLEMS

Potentially interested institutions, and their priorities, are those suggested by Dr. B. D. Laroia (L) of the University Grants Commission and Dr. H. A. B. Parpia (P) of the Council of Scientific and Industrial Research. R = endorsement of Problem by Dr. M. S. Randhawa of the Indian Council of Agricultural Research.

UR-RP-S-(21)-1
The effects of high energy radiation on the induction and half-life of excited, free, and/or ionized radicals in cotton cellulose.
L1 P2 Indian Central Cotton Committee, Technological Laboratory, Matunga, Bombay.
P1 Indian Agricultural Research Institute, Pusa. B. P. Pal, Director.
R

UR-RP-S-(41)-2
Halocarbination of unsaturated cottonseed fatty materials.
L1 P1 Regional Research Laboratory, Hyderabad.
L2 P3 Indian Institute of Science, Bangalore.
P2 Oil Technology Institute, Anantapur. Dr. K. S. Murti.
L3 P4 Osmania University, Hyderabad.

UR-RP-S-(21)-3
Investigation of new solvents for molecular weight determination of cellulose.
P1 National Chemical Laboratory, Poona.
L1 P2 University of Bombay, Bombay.
L2 P3 Indian Institute of Science, Bangalore.

UR-RP-S-(21)-4
The synthesis and properties of new aziridinyl phosphorus compounds for use in the preparation of new products to increase the utilization of cotton.
L1 P1 National Chemical Laboratory, Poona.
L2 P3 Indian Institute of Science, Bangalore.
L3 P2 Shri Ram Institute for Industrial Research, Delhi.
R

UR-RP-S-(21)-5
Fundamental investigations of the positions occupied on the glucose units by the substituents of various chemically modified cottons.
P1 National Chemical Laboratory, Poona.
L1 P2 Ahmedabad Textile Industries Research Association, Ahmedabad.
L2 P3 Indian Institute of Science, Bangalore.

2- Research Problems

UR-RP-S-(21)-6
X-ray study of crystallite orientation and spiral angle in native and chemically modified cottons to develop criteria for evaluating chemical treatments designed to increase utilization of cotton.
L1 Madras University, Madras.
P1 National Chemical Laboratory, Poona.
R

UR-RP-W-(13)-1
Determination of the importance of lipid constituents of rice to texture and flavor characteristics, thus providing information useful in expanding consumption of U. S. rice domestically and abroad.
L1 P1 Central Food Technological Research Institute, Mysore.
P2 Rice Research Institute, Cuttack.

UR-RP-W-(44)-3
Preparation of polymerizable monomers from castor and Dimorphotheca oil.
L1 P1 Regional Research Laboratory, Hyderabad.
L2 Indian Agricultural Research Institute, New Delhi.
R

UR-RP-W-(61)-7
Basic characterization of the proteins of poultry with regard to those properties of potential importance to texture (tenderness) and juiciness of cooked poultry and hence of importance in consumer demand for and utilization of poultry.
L1 P1 Central Food Technological Research Institute, Mysore.
P2 Indian Veterinary Research Institute, Izatnagar.
R

UR-RP-W-(33)-8
Determination of the acute and chronic toxicities of biphenyl in experimental laboratory animals.
L1 P2 Central Drug Research Institute, Lucknow.
Dr. Mukerjee.
P1 Nutrition Research Institute, Hyderabad.

UR-RP-W-(51)-9
Chronic oral toxicity study of sucrose-fatty acid esters.
L1 Haffkine Institute, Bombay.
L2 University of Lucknow, King Edward Medical College, Lucknow.
P1 Nutrition Research Institute, Hyderabad.
P2 Central Drug Research Institute, Lucknow.

UR-RP-E-(65)-2
A study of salt migration in muscle tissue in order to develop improved curing methods and better cured meat products for use in warm climates.
L1 P1 Central Food Technological Research Institute, Mysore.
R

3- Research Problems

UR-RP-N-(14)-1
Investigations of the composition of nonprotein nitrogen constituents of grain sorghum as a basis for increasing its utilization in feed and food products.
L1 P2 Indian Agricultural Research Institute, New Delhi.
P1 Central Food Technological Research Institute, Mysore.
R

UR-RP-N-(10)-2
Rheological studies on modified cereal starches by investigating the changes in flow characteristics during the paste preparations, and at high shear rates after pasting, to provide fundamental information needed for the continued and increased utilization of starch in paper coating applications.
L1 National Chemical Laboratory, Poona.
L2 University of Allahabad? - doubtful.

UR-RP-N-(49)-3
Chemical and physical modifications of the fiber components of fat-free safflower meal to increase its digestibility for use as feed.
L1 P1 Regional Research Laboratory, Hyderabad.
L2 P2 Shri Ram Institute for Industrial Research, New Delhi.

UR-RP-N-(42)-4
Investigation of the isoflavones of petroleum ether-extracted soybean meal as a basis for improving the feeding value of soybean oil meal.
P1 Central Food Technological Research Institute, Mysore.
L1 University of Delhi, New Delhi.
P2 University of Calcutta, Calcutta. Dr. B. C. Guha.

UR-RP-N-(40)-9 (Counterproposal to Proposal A7-e)
Development of a high-protein food product for India by alcohol-water extraction of fat-free meal from U. S. soybeans.
P1 National Chemical Laboratory, Poona. (Laroia says not suited.)
L1 University of Bombay, Bombay.

UR-RP-N-(14)-10
Investigations on the quantitative separation of grain sorghum proteins into pure homogenous protein components to provide basic information for further characterization and applied studies.
L1 P1 Indian Institute of Science, Bangalore. Dr.P.S. Sarma.
P2 University of Calcutta, Calcutta. Dr. B. C. Guha.

Attachment 4

INSTITUTIONS VISITED, OR ON WHICH INFORMATION WAS ACQUIRED

A. INSTITUTIONS AND AGENCIES VISITED

		Report No.
	India	
Allahabad:	University of Allahabad	9
Anand:	Kaira District Cooperative Milk Producers Union, Ltd.	3
	Institute of Agriculture	11
Bangalore:	Indian Institute of Science	5
Bombay:	University of Bombay, Dept. of Chem. Technology	2
Madras:	Central Leather Research Institute	7
	Madras University	8
Mysore:	Central Food Technological Research Institute	6
New Delhi:	Council of Scientific and Industrial Research	1
	University Grants Commission	1
	Indian Council of Agricultural Research	1
Poona:	National Chemical Laboratory	4
	Pakistan	
Karachi:	Institute of Cotton Research and Technology	13
	Pakistan Central Cotton Committee	13
	Italy	
Rome:	European Regional Office of FRTPD	15

B. OTHER INSTITUTIONS

Dehra Dun:	Forest Research Institute and Colleges	11
Izatnagar:	Indian Veterinary Research Institute	11
Karnal:	National Dairy Research Institute	10
	Pakistan	
Lyallpur:	Punjab Agricultural College	14

Attachment 5

ITINERARY OF S. B. DETWILER, JR.

November-December, 1960

(Times shown are actual, not scheduled, local times of arrival and departure. Time differentials: New York, -5 hours; London, 0; Rome, +1; Karachi, +5; India, +5½.)

Tue Nov 1	1515	Lv Washington, Fl EA-340.
Tue Nov 1	1730	Ar New York.
Tue Nov 1	2105	Lv New York, Fl PA-2. Stops at London, Frankfort, Vienna, Istanbul, Beirut.
Thu Nov 3	0254	Ar Karachi.
Thu Nov 3	0607	Lv Karachi, Fl BOAC-936.
Thu Nov 3	0805	Ar Delhi.
		Operations in Delhi, Nov 3-13.
Mon Nov 14	0735	Lv Delhi, Fl IAC-405.
Mon Nov 14	1029	Ar Bombay.
		Visit University of Bombay, Nov 14-15.
Tue Nov 15	2100	Lv Bombay by train.
Wed Nov 16	0525	Ar Anand.
		Visit Kaira District Cooperative Milk Producers Union, Nov 16.
Wed Nov 16	2308	Lv Anand by train.
Thu Nov 17	0730	Ar Bombay.
Thu Nov 17	1710	Lv Bombay by train.
Thu Nov 17	2020	Ar Poona.
		Visit National Chemical Laboratory, Nov 18-19.
Sat Nov 19	1715	Lv Poona by train.
Sat Nov 19	2150	Ar Bombay.
Sun Nov 20	0900	Lv Bombay, Fl IAC-105.
Sun Nov 20	1139	Ar Bangalore.
		Visit Indian Institute of Science, Nov 21.
Tue Nov 22	0950	Lv Bangalore by automobile.
Tue Nov 22	1230	Ar Mysore.
		Visit Central Food Technological Research Institute, Nov 23-24.

2-Itinerary of S.B. Detwiler, Jr.

Thu Nov 24	1725	Lv Mysore by automobile.
Thu Nov 24	2100	Ar Bangalore.
Fri Nov 25	0858	Lv Bangalore, FL IAC-104.
Fri Nov 25	1000	Ar Madras.
		Visit Central Leather Research Institute, Nov 25-26.
		Visit Madras University, Nov 26.
Sun Nov 27	1510	Lv Madras, Fl IAC-404.
Sun Nov 27	2107	Ar Delhi.
		Operations in Delhi, Nov 28-30.
Wed Nov 30	2155	Lv Delhi by train.
Thu Dec 1	1120	Ar Allahabad.
		Visit University of Allahabad, Dec 1-2.
Fri Dec 2	1610	Lv Allahabad, Fl IAC-412.
Fri Dec 2	1915	Ar Delhi.
		Operations in Delhi, Dec 3-6.
Tue Dec 6	2110	Lv Delhi, Fl PK-205.
Tue Dec 6	2310	Ar Karachi.
		Visit Institute of Cotton Technology and Embassy, Dec 7-8.
Fri Dec 9	0835	Lv Karachi, Fl EM-573 (Qantas). Stops at Bahrein, Cairo.
Fri Dec 9	1502	Ar Rome.
		Visit to Rome Office, Dec 12,13,15 (On leave, Dec 14).
Thu Dec 15	1524	Lv Rome, Fl AF-141.
		On leave hereafter except for travel time needed to return home.
Thu Dec 15	1546	Ar Nice.
Sat Dec 17	1427	Lv Nice, Fl AF-1216.
Sat Dec 17	1613	Ar Paris.
Tue Dec 20	1427	Lv Paris, Fl AF-844.
Tue Dec 20	1459	Ar London.
Sat Dec 24	1716	Lv London, Fl PA-1.
Sat Dec 24	2042	Ar New York.
Sun Dec 25	0013	Lv New York, Fl EA-545.
Sun Dec 25	0124	Ar Washington.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D.C.

February 28, 1961

TO: Guido E. Hilbert, Director, Foreign Research and Technical Programs Division

FROM: Samuel B. Detwiler, Jr., Special Assistant to the Administrator

SUBJECT: Foreign Travel, 1960 - Report No. 2
India: University of Bombay, Bombay (November 14-15)

Mr. E. R. DeMoss and I visited the Department of Chemical Technology, University of Bombay, on November 14 and 15, 1960. We held discussions with the following persons, among others:

Professor G. D. Parikh, M.A., Rector of the University
G. M. Nabar, Ph.D. (Manchester), Mody Professor of Chemical Technology and Director of the Department of Chemical Technology
J. G. Kane, Ph.D. (Wisconsin), Professor of Oil Technology and Head of the Oils, Fats, and Waxes Laboratory
D. Rebello, Ph.D. (Pittsburgh), Sir Homi Mehta Reader in the Technology of Oils, Fats, and Waxes and member of the Oils, Fats, and Waxes Laboratory
E. H. Daruwalla, Ph.D. (Manchester), Professor of Textile Chemistry and Head of the Textile Chemistry Laboratory

Principal purpose of this visit was the negotiation of grants for the following projects, which represented modifications of proposals originally submitted by the institution in December, 1958:

UR-A7-(40)-3
A study of the relationship of substituent fatty acid groups to the physical properties of diacid triglycerides of palmitic and stearic acids, as a means of increasing the utilization of cottonseed oil for food and industrial purposes.
Principal investigator: D. Rebello

UR-A7-(20)-4
Investigation of the photochemical degradation of cotton, to derive information which would enhance the utilization of cotton.
Principal investigator: E. H. Daruwalla

Grant Negotiations

UR-A7-(40)-3. - Technical negotiations were conducted with Dr. Rebello, the principal investigator, on the basis of the Approval Copy of the cleared but unsigned research project. They were later reviewed and confirmed with Dr. Nabar.

The plan of work of this project represented a considerable modification of the institution's original proposal, and was in effect a counter-proposal. Dr. Rebello was disappointed that the plan would not permit him to work on derivatives of unsaturated fatty acids, inasmuch as oleic acid was his principal interest; however, I explained that work on oleic acid derivatives was well covered by the domestic research program of UR&D. Accordingly, he accepted our plan of work with the stipulation that determinations of smoke, flash, and fire points be deleted, as this would consume unduly large quantities of samples that would probably be available only in small amounts. I tentatively accepted this change, subject to clearance by UR&D. (Subsequently, the change was cleared with UR&D.)

UR-A7-(20)-4. - Technical negotiations were conducted with Dr. Daruwalla, the principal investigator, on the basis of the Approval Copy of the cleared but unsigned research project. They were later reviewed and confirmed with Dr. Nabar.

The plan of work of this project represented a considerable modification of the institution's original proposal. However, Dr. Daruwalla readily accepted our plan, subject only to the stipulation that we delete the proviso for use of chromatographic techniques in determining the kinetics of the cotton degradation mechanism; he felt that sundry other techniques, more readily applicable, would lead to the same results. I tentatively accepted this change, subject to clearance by UR&D. (Subsequently, the change was cleared with UR&D.)

Comments Applicable to Both Projects. - It was made clear to Dr. Nabar that grant negotiations were on a tentative basis, subject to clearance by the Damle Committee at New Delhi.

Fiscal negotiations of both projects were conducted by Mr. DeMoss with Professor Parikh and Dr. Nabar, in the presence of myself and the principal investigator concerned. Professor Parikh indicated that the general grant provisions would have to be cleared by the University Syndicate (Board of Governors). An economist by training, he asked several questions that are mentioned as illustrative of points raised here and there at other institutions during our India trip:

(1) Section (8) of the general provisions provides that grantee shall furnish a final report in a form suitable for publication. Professor Parikh wondered who would publish the report, over whose name.

(2) Section (14) provides that a grant may be terminated unilaterally by the Director of FRTPD. Would a period of grace be involved? If not, the institution might be embarrassed by commitments to personnel working on the grant.

(3) In the event of the early termination of a grant, Professor Parikh wondered what would happen to our interest in special equipment.

(4) Section (16) provides that a license to practice any invention (in India and elsewhere) throughout the world shall be issued to the U. S. Government. Professor Parikh felt that this might be prejudicial to the University's interests; I inferred that he visualized our licensing American firms to practice an invention in India.

Apparently our answers to these questions were satisfactory to Professor Parikh, since revised proposals for both projects were later cleared by the University and sent forward to New Delhi.

Professor Parikh indicated that the University was operating on a deficit, and questioned our policy whereby the University would be required to pay up to half the special equipment costs. However, he apparently reconsidered the point after our visit.

The principal uncertainty in discussions at the University involved their ability to obtain foreign exchange for purchase of special equipment needed for work under the grants. Over a four-year period, the Department of Chemical Technology did obtain a gift of some $60,000 to $70,000 worth of good U. S. equipment out of the Wheat Loan Fund, whereunder equipment has been provided to Indian universities, and students have been sent abroad for graduate training; but apparently equipment is no longer available from this source. As an example of the present situation, I was shown an Atlas Fade-O-Meter that had been out of service for months because approval could not be obtained for purchase of replacement parts, chiefly a mercury arc bulb; the finance authorities in New Delhi apparently were not impressed by the assertion that the bulb must be made of UV-transmitting glass, and that an ordinary Indian-made light bulb would not serve the purpose. Another example concerned an old Beckman DU spectrophotometer that needed a new hydrogen lamp, costing Rs 200 (about $40); the Department has been waiting three years to get the lamp.

The University is buying some supplies, such as quartz crucibles, from East Germany and paying for them with rupees. However, complicated equipment is not available from this source. The exchange position as concerns West German marks and British pounds also is acute, although not as severe as with dollars.

Dr. Nabar agreed to prepare revised proposals for the two projects, using our title and objective, and following the language of the plan of work as modified during negotiations. To avoid any possibility of misunderstanding, I left him a skeleton outline of each revised proposal, having filled in the critical paragraphs. Also, for the information of the Damle Committee, I provided for indication that these were revised proposals, not new proposals, and that they had been negotiated by Mr. DeMoss and me.

In a letter to me at New Delhi, dated December 1, Dr. Nabar sent me information copies of both revised proposals, and indicated that he was sending 10 copies of each to Secretary of Agriculture K. R. Damle for clearance. Both of the revised proposals were prepared exactly in accordance with my suggestions.

Copies of the original and revised proposals for A7-3 and A7-4, related correspondence, and the research projects before and after grant negotiations, are being supplied to Dr. Oman in New Delhi.

I was impressed by the apparent competence of Dr. Rebello and Dr. Daruwalla, the principal investigators for A7-3 and A7-4, respectively, and feel that good results can be expected of them when the two grants get under way. Dr. Nabar appears to be an able research administrator; I am sure that he can be counted upon to keep in close touch with the work, while at the same time giving the investigators adequate latitude in daily operations.

Status and Indicated Action. - The minor changes in the plan of work of A7-3 and A7-4, as agreed upon during negotiations, have been cleared within Utilization Research, and the Approval Copy of each project is being modified accordingly. Reports of Technical Negotiation are currently in preparation, and Mr. DeMoss' Reports of Fiscal Negotiation have already been prepared. The revised proposals submitted to Mr. Damle are entirely in order. Accordingly, once the revised proposals are cleared by the Damle Committee, there would appear to be no hindrance to speedy issuance and execution of grant letters.

It is suggested that Dr. Oman inquire into the status of the revised proposals before the Damle Committee, and attempt to secure their prompt clearance.

Discussion of Research Problem

Dr. Daruwalla expressed interest in the following Research Problem, developed by the Utilization Review Panel, that I had brought with me:

UR-RP-S-(21)-3
Investigation of new solvents for molecular weight determination of cellulose

He called attention to two recent publications in this field by European workers, of which he thought we might not be aware*. Also, he asked permission to keep the problem for further study.

Subsequently, with his letter of November 23, 1960, Dr. Nabar sent me the synopsis of a proposal based on this Research Problem, expanding the plan of work in some detail. The proposed principal investigator, rather than Dr. Daruwalla, would be Dr. Waman B. Achwal, Reader in the Technology of Dyeing and Printing. Although Dr. Nabar offered to send in a formal detailed proposal on request, I believe that this will be unnecessary; instead, the Utilization Review Panel is being asked to consider preparing a project directly from the synopsis.

Other Comments

I discussed with Dr. Nabar the two projects UR-A7-(00)-1 (k) and UR-A7-(10)-2, representing modifications of proposals submitted in 1958 by Dr. A. Sreenivasan at a time when he was head of the Food Technology Laboratory of the Department of Chemical Technology. I advised him of our feeling that the two projects ought to be continued with Dr. Sreenivasan in his new post as assistant director of the Central Food Technological Research Institute in Mysore. Dr. Nabar concurred in this decision, even though one of the proposals (A7-1) had been resubmitted in August 1960 by Dr. D. V. Rege, who apparently has succeeded Dr. Sreenivasan in charge of the Food Technology Laboratory.

Since a project can doubtless be developed from Research Problem S-3, we can expect to have three grants with the Department of Chemical Technology in the not-too-distant future, assuming that clearance can

---

*(1) Hans Vink (Institute of Physical Chemistry, University of Uppsala). Arkiv for Kemi 14, 195 (1959). Oxidative degradation of cellulose in alkaline solutions.

(2) Lea Valtasaari (State Institute for Technical Research, Helsinki). Paperi ja Puu (Paper and Timber) 39, 245 (1957). Studies on the improvement of cellulose solvents based on iron tartaric acid complex.

be obtained with the Damle Committee. I agreed with Dr. Nabar that he was the best judge of how many grants the Department could handle without undue interference with its regular work. However, I suggested that we would be interested in receiving a few additional proposals, particularly from Dr. Kane (Oils, Fats, and Waxes) and Dr. Rege (Food Technology). Inasmuch as I had given Dr. Nabar a copy of the FRTPD brochure on the P.L. 480 program (dated October 10, 1960), and discussed it with him, he should be well aware of the type of proposal that we are interested in receiving.

Following completion of grant negotiations, Dr. Daruwalla showed me over the Textile Chemistry Laboratory. And in the brief time remaining I discussed some of the work of the Oils, Fats, and Waxes Laboratory with Dr. Kane and Dr. Rebello. Notes on these visits appear in Attachment 1.

Attachment 1 - Notes on the Department of Chemical Technology, University of Bombay.
Attachment 2 - Acknowledgement Letter of 2/24/61, Detwiler to Nabar.

Attachment 1

NOTES ON THE DEPARTMENT OF CHEMICAL TECHNOLOGY, UNIVERSITY OF BOMBAY

(The Department was visited also by Sam R. Hoover on November 5, 1959. See his trip report, pp. 17-18.)

General

The University of Bombay's Department of Chemical Technology was organized in 1933 and began operations the following year, in furtherance of a move to improve the status of technological education in institutions of the then Bombay Presidency. Special attention has been given to textile chemistry, since cotton is the staple industry of the Bombay region; however, teaching and research are conducted also in the fields of oil, fat, and wax technology, dyestuff technology, pharmaceutical chemistry, food technology, polymer technology, and engineering, particularly chemical engineering.

First head of the Department was the late Dr. R. B. Forster of Leeds University. He was succeeded in 1938 by Professor K. Venkataraman, who left in 1957 to become director of the National Chemical Laboratory at Poona. (See my Report No. 4.) Present head of the Department is Professor G. M. Nabar, who was trained at the University of Manchester and has specialized in bleaching, finishing, cellulose chemistry, and the chemistry of the dyeing linkage.

Since 1943 the Department has been located apart from the University proper, on perhaps 4 acres of ground in the suburb of Matunga. It is housed in a large, two-story main building and sundry auxiliary buildings that appear to be commodious enough; I was told, however, that the Department is cramped for space but cannot expand because the suburb has grown up around them.

The staff comprises about 80 people, including the director; 8 professors (one or two posts are vacant); 16 readers; 14 lecturers; and 29 demonstrators. Additionally, specialized courses are taught by about 15 experts from other institutions.

The major source of the Department's income is not clear. However, it has received a large number of endowments, scholarships, and grants from private sources, the Bombay Government, and such Indian Government agencies as the University Grants Commission, the Council of Scientific and Industrial Research, and the Ministry of Education. Also, small grants have been made by the American Chemical Society and the Williams-Waterman Fund of the Research Corporation, New York.

The Department offers degrees of (1) B.Sc.(Tech.), based on a two-year course of lectures and apprentice training, with a B.Sc. from the University of Bombay or equivalent as a prerequisite; (2) B.Chem.Eng., a four-year course; (3) B.Pharm., a three-year course; (4) M.Sc.(Tech.) and Ph.D. in Chemical Technology; and (5) M.Sc. and Ph.D. in Chemistry or Physics and Ph.D. in Mathematics.

The student body during the academic year 1960-61 numbers about 500, of whom 123 are working on advanced degrees, as follows: M.Sc.(Tech.), 70; M.Sc.(Science), 26; Ph.D.(Tech.), 12; Ph.D.(Science), 15.

Through 1959, the Department had awarded degrees as follows: B.Sc.(Tech.), 1500; M.Sc.(Tech.), 163; M.Sc.(Chemistry), 34; Ph.D. (Chem.Tech.), 64; Ph.D.(Chemistry), 34.

Textile Chemistry Laboratory

This unit, under Dr. Daruwalla's supervision, appears well equipped to handle instruction and research on bleaching, dyeing, printing, and finishing operations; they are not set up to do work on spinning and weaving. The different units include a large-scale dye-house, an experimental dyeing laboratory, textile auxiliaries laboratory, singe room, research laboratory, yarn and cloth testing room, and finished goods room.

The dye-house is intended more for the practical instruction of students than for research. It can handle fabrics up to a yard wide. It appeared well-provided with semi-plant scale equipment, mostly British-made, perhaps 20 to 25 years old, the gift of an Indian philanthropist. A sampling of this equipment includes a 100-pound high-pressure (25 psi) kier with external heater; hank mercerizing machine; stainless steel wince dyeing machine; Krants hank dyeing machine (25 pounds); Thies and Franklin cheese dyeing machines; laboratory model of woods-metal dyeing machine for elevated temperatures; Obermaier cotton, cheese, and cop dyeing machine; three-color printing machine and drying range; 15-cylinder drying machine; hot air drying cupboard; Mather-Platt baking stove for special finishes; high-pressure steaming apparatus; three-bowl universal calender; mist spray damping machine; plaiting machine; and Smith drum high temperature-pressure package drying machine.

The singe room houses a two-burner gas singeing machine.

In other laboratories of the Textile Chemistry section I noted many modern pieces of equipment, much of it given to the Department under provisions of the Wheat Loan Fund. For example, the research laboratory has a Shirley crease-recovery and stiffness tester, a gas fading tester (for NO_2, CO_2, etc.), Atlas Launder-O-Meter, a British-made Dye-O-Meter, DuNouy tensiometer, electrotitration apparatus, photovolt reflectometer, torsion balance, Mettler single-pan balance, rotary microtome, etc. Equipment in the textile auxiliaries laboratory included a Hoppler viscometer with thermostatic control, Stormer viscometer, Premier colloid mill, and Bundesmann water-repellency tester. And the yarn and cloth testing laboratory contains a single thread tester, Mullen tester, abrasion testing machine, etc. In one laboratory I noted an interesting density gradient column, apparently home-made, for measuring fiber density.

Available spectrophotometric equipment is adequate. For visible work there is a Beckman DU. For the ultraviolet range they have a Beckman

recording instrument. For infrared work they have a Perkin-Elmer automatic instrument with three prisms--NaCl (2 to 14 microns), KBr (up to 25 microns), and LiFl (1 to 6 microns). There is no X-ray equipment; however, the Department has access to equipment owned by the Indian Central Cotton Committee in Bombay.

In view of the scarcity of replacement parts, special pains are taken to care for the higher-priced items of equipment. As I remember, the spectrophotometric apparatus is handled by only one designated worker, and is kept under lock and key.

If these notes show a preoccupation with the availability of equipment, it is because of my feeling that this factor will be just as important as the caliber of research workers in the development of a sound grants program in India.

There was little opportunity to talk to individual research workers. However, I did observe research in progress on the kinetics of desorption of water from cellulose, heat of reaction between dyes and fibers, resin preparation and other aspects of drip-dry treatments, and hydrolytic and oxidative degradation of cellulose. In discussing the latter activity, Dr. Daruwalla expressed regret that he had not had the opportunity to undertake our Israeli grant (Project UR-A10-(20)-4) on the mild oxidation of cotton.

I received a file of reprints of papers on cellulose chemistry by Nabar, Daruwalla, and other members of the Department; these will be made available to the Utilization Review Panel. Also, I have a complete list of the Department's publications from 1934 through 1959.

A side-line interest of Dr. Daruwalla is the development of uses for lac, which appears to have lost most of its old markets in the United States and India. He is using the dye from lac, with metal mordants, to color silk, wool, and rayon. With different metals he gets a whole range of bright colors that he claims are laundry- and light-fast. I was impressed by the swatches of cloth that he showed me.

Daruwalla was trained at Uppsala as well as at Manchester. In our discussions of his projected grant and the Research Problem that I offered him, it was evident that he is very well informed on current developments in cellulose chemistry. Having no family ties, he lives at a hotel, keeps long hours at the Department, and has all the earmarks of a dynamic, dedicated worker. Although I did not meet all of the staff, I am prepared to accept Dr. Hoover's statement that Daruwalla's is the strongest research program in the Department.

Oils, Fats, and Waxes Laboratory

There was time for only a brief inspection of this section. It comprises five laboratories--a research laboratory, two analytical laboratories, two process laboratories, and a separate room for solvent extraction and oil milling. They are equipped for basic and applied research as well as for routine analysis. Equipment includes a baby

expeller, a two-ton expeller, batch-type solvent extraction unit, 5-high roller mill, and various oil processing units. Among the smaller apparatus I noted some good pieces of Wheat Loan equipment, including a Swift stability apparatus, an apparatus for measuring detergent efficiency under standardized conditions, and a stirrer-equipped hydrogenation bomb that was rated up to 2000 pounds; however, they have not fared as well on such equipment as did the Textile Chemistry Laboratory. Their experience in having equipment fabricated by Indian artisans has not been too successful, partly because of trouble in obtaining sheet metal and other raw materials; I did notice, however, a home-made still for recovering fatty acids from cottonseed oil foots, that appeared to be serviceable.

Dr. Kane, in charge of the Laboratory, is an older man who received his training at Wisconsin. In our discussion he indicated particular interest in the composition and utilization of various Indian oilseeds, and in the composition of essential oils. His reprints, of which I have a file, include papers on surface-active properties of sulfated esters of castor oil fatty acids, processing of cottonseed oil soapstock, molecular distillation of various vegetable oils, and the hydrogenation of castor and other oils. I indicated to Dr. Nabar that we should be glad to receive and evaluate a research proposal from Dr. Kane.

Dr. Kane also has published sundry reviews of the Indian oilseeds industry; and he is very active in interagency oilseeds committee work.

Dr. Rebello, although a member of this Laboratory, appears to report direct to Nabar rather than to Dr. Kane. He is a younger man, trained under Daubert at Pittsburgh, who has spent some time in the United States. Rebello is well-informed and aggressive, and should do a creditable job in his work under our project A7-3.

Like many or perhaps most Indian chemists, Rebello is working to improve the country's foreign exchange position by making it independent of imports. One of his interests involves finding a replacement, or at least an extender, for cocoa butter, which is much used in India for confectionery and other purposes. He has been experimenting with cocum butter (kokum butter, from Garcinia indica?), which is similar to cocoa butter but has a different melting range and different plastic properties. The two butters are incompatible in physical mixture; but by means of interesterification Rebello has obtained a smooth product that has interesting potentialities.

Another of Rebello's interests involves the regeneration and re-use of nickel formate hydrogenation catalysts, for which the nickel has to be imported from Canada. Also, he is about to publish on the solvent alkali refining of oils and fats, and on oxidation methods for determining the glyceride composition of fats.

Other Laboratories

I did not visit the other laboratories of the Department, which include food technology, chemical engineering, plastics, dyestuffs, pharmaceuticals, and pigments, paints, and varnishes. However, information on these groups is given in the Department's Handbook for 1960 and its list of publications, which will be made available to the Utilization Review Panel.

I have a list of periodicals received by the Department's library, which indicates a quite adequate coverage of the literature.

Attachment 2

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington 25, D. C.

Office of Administrator

February 24, 1961

Dr. G. M. Nabar, Director
Department of Chemical Technology
University of Bombay
Matunga Road
Bombay 19, India

Dear Dr. Nabar:

I want to thank you for the many courtesies extended to Mr. DeMoss and me by yourself and your colleagues, Drs. Kane, Daruwalla, and Rebello, during our visit to your Department on November 14 and 15, 1960. I am sorry that the pressure of daily duties in Washington has prevented my making an earlier response.

I wish also to acknowledge and comment on the following communications received from your Department since the time of our visit:

(1) Your letter of December 1 to me at New Delhi, enclosing information copies of your revised proposals UR-A7-(40)-3 and UR-A7-(20)-4.

These proposals appear to be entirely in accordance with our discussions. Further action on our part will await their clearance by the Damle Committee.

(2) Your letter of November 23 to me at New Delhi, enclosing a synopsis of a proposal based upon our Research Problem UR-RP-S-(21)-3, 'Investigation of new solvents for molecular weight determination of cellulose.'

Although you offered to prepare a complete proposal based upon the synopsis, I believe that this step will not be necessary in the present instance. Instead, we shall expect to use your synopsis in preparing a research project, and subsequently to bring this project to your attention; clearance by the responsible Indian authorities in New Delhi can be sought at that time. The next action, then, will be on our part.

(3) Dr. Kane's letter of November 17 to me at Bangalore, in care of Dr. Sarma, forwarding a file of his reprints under separate cover.

I, too, am sorry that because of the pressure of grant negotiations, I could not spend more time with Dr. Kane while in Bombay. However, the reprints will be of value in familiarizing ourselves with his work. In case you desire to send us a research proposal in a field of interest to Dr. Kane, we shall be glad to review and evaluate it.

(4) Dr. Daruwalla's letter of December 20 to me at New Delhi, advising that a file of reprints and other papers, addressed to me in New Delhi, had been damaged in transit and returned.

Apparently the file was again sent to me in New Delhi and again returned, then addressed to me in Washington; at any rate, I received it here just the other day. I shall find particularly valuable the handbook of your Department, your annual report for 1959-60, the list of publications, and the list of periodicals in your library. The reprints on cellulose chemistry will be very useful to our technical experts.

I may have told you that a Far Eastern Regional Research Office was being established in New Delhi to aid in the conduct of our Public Law 480 grants program. This office is now in operation, with Dr. Paul W. Oman as its director. Further word on the progress of your grant proposals will doubtless come to you from Dr. Oman. In the interim, if you have any questions, they may be addressed to Dr. Oman in care of the Agricultural Attache, American Embassy, New Delhi.

Sincerely,

S. B. Detwiler, Jr.
Special Assistant to the Administrator

ARS:OA
SBDetwiler, Jr./jrg

cc-Dr. Hilbert
Dr. Irving
Mr. Marston
Dr. Oman, New Delhi

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D. C.

July 21, 1961

TO: Guido E. Hilbert, Director, Foreign Research and Technical Programs Division

FROM: Samuel B. Detwiler, Jr., Special Assistant to the Administrator

SUBJECT: Foreign Travel, 1960 - Report No. 3
India: Kaira District Cooperative Milk Producers Union, Ltd., Anand (November 16)

Mr. E. R. DeMoss and I visited the Kaira District Cooperative Milk Producers Union, at Anand, on November 16, 1960. Anand is a small town in Gujarat State, 266 miles north of Bombay and midway between Ahmedabad and Baroda.

We held discussions with the following persons, of whom the first five constitute the top administrative and technical staff at the Union:

Mr. V. Kurien, General Manager. (B.E. in India, M.S. Michigan)
Mr. H. M. Dalaya, Assistant General Manager. (M.S. Michigan)
Mr. P. H. Bhatt, Manager for Administration. (M.Sc. Oregon State)
Dr. J. D. Contractor, Manager for Production. (M.Ag. Florida, Ph.D. Massachusetts)
Dr. I. M. Patel, Quality Control Officer. (Ph.D. Wisconsin)
Dr. G. H. Wilster, Professor Emeritus of Food and Dairy Technology at Oregon State College, and FAO Dairy Expert stationed at Anand during 1960-61.

Purpose of this visit was the negotiation of a grant for the following project:

UR-A7-(60)-13
Investigations of the addition of non-fat dry milk solids to buffalo milk in the manufacture of hard cheese, as a means of expanding overseas markets for dry milk.

This project was not based on a proposal submitted by the Union, but rather was an idea developed in early 1960 by Dr. Sam R. Hoover of UR&D. Mr. Marston brought it to the Union's attention in his letter of October 19, 1960, and Mr. Kurien expressed interest in his response of November 5.

Grant Negotiations

Mr. DeMoss and I conducted fiscal and technical negotiations with Messrs. Dalaya, Contractor, and Bhatt, with the active assistance of Dr. Wilster. Mr. Dalaya was named as the principal investigator. The duration of the work was set at five years. Since the Union normally conducts commercial-scale operations, it was necessary to provide for certain items of

pilot-plant equipment, including a 150-gallon cheese vat, a 100-gallon batch pasteurizer, sanitary pump and pipes, and 20-pound daisy molds, which would be entirely chargeable to the grant. It was assumed that foreign exchange would be involved in the purchase of these items and the nonfat dry milk needed for the work.

Mr. Dalaya requested several modifications of our plan of work, including provision for studies of dry milk in processed cheese and cheese spreads, and permission to conduct several commercial-scale runs if warranted by the results of the pilot-plant work. These changes were tentatively accepted by me and later cleared with UR&D. They appear in the revised plan as quoted in my report of technical negotiations, and in the revised project as approved by UR&D.

In connection with calculations of materials needed for the work, the following schedule of runs was assumed:

First year: no runs (obtaining and setting up equipment)
Second year: 300 runs
Third year: 300 runs
Fourth year: 150 runs (cutback while evaluating previous results)
Fifth year: 300 runs plus 6 commercial-scale tests

It was assumed that each pilot run would require 520 pounds of buffalo milk (at Rs 0.30 per pound) and 48 pounds of nonfat dry milk (at Rs 0.75 per pound). It was further assumed that the commercial tests would be scaled up 7 times from the pilot-plant runs.

Mr. Dalaya prepared a "revised proposal" containing the modified plan of work and cost estimates agreed upon during negotiations. Mr. Kurien cleared this proposal, as well as the general grant provisions, on his return to Anand the same evening. Mr. Kurien stipulated that none of the cheese produced under the grant would be sold for a profit.

Mr. Kurien was requested to submit the revised proposal to the Damle Committee in New Delhi for clearance. Such a proposal was considered by the Committee at its meeting of April 21, 1961; presumably (except for possible expansion of the "importance of work" statement) it is the same as the copy I received on November 16.

Mr. Kurien indicated that the Gujarat State Department of Agriculture, at Ahmedabad, has certain supervisory authority over the Kaira Cooperative; and to avoid administrative delays, he asked that the State government be suitably advised that the negotiations had taken place with the sanction of the Damle Committee. Accordingly, at my instance, Mr. Davis wrote to Mr. Damle on November 22 (Attachment 1) to apprise him of the situation, sending a copy of the letter to the State government.

Status and Indicated Action. - The changes in the plan of work, as discussed during negotiations, have been cleared with UR&D. The negotiators' reports of technical and fiscal negotiation have been prepared. The Cooperative's "revised proposal," presumably conforming to agreements reached during negotiations, was cleared by the Damle Committee on April 21, 1961, "provided the foreign exchange is arranged by the Union." Accordingly, UR&D has approved the research project and has recommended that FRTPD prepare and forward a grant letter for the institution's concurrence. The Cooperative's ability to find foreign exchange for the needed equipment and dry milk would appear to be the only unresolved question.

Other Research Ideas

I had with me no Research Problems that were suitable for offer to the Cooperative; and during my discussions at the plant, no suggestions for additional research were offered to me. We do have a clear picture of the firm's interests and facilities; and it is entirely possible that after the present grant has been executed and has made appreciable progress, additional projects of mutual interest may be developed. Although the Cooperative is a commercial enterprise, it appears well suited to the conduct of applied research by virtue of the scientific and engineering background of the top officials.

Attachment 1 - Letter of November 22, 1960, Davis to Damle
Attachment 2 - Notes on the Kaira District Cooperative Milk Producers' Union,Ltd.

Attachment 1

American Embassy
New Delhi

November 22, 1960

Mr. K. R. Damle, Secretary
Department of Agriculture
Krishi Bhavan
Queen Victoria Road
New Delhi 1

Dear Mr. Damle:

At our meeting on November 5 with your Committee for consideration of proposals for agricultural research grants under U.S. Public Law 480, the following proposal was one of several that we discussed by title:

Investigations of the addition of non-fat dry milk solids to buffalo milk in the manufacture of hard cheese, as a means of expanding overseas markets for dry milk

Institution: Kaira District Cooperative Milk Producers' Union, Ltd., Anand

USDA Project No. UR-A7-(60)-13

At the meeting, you suggested that our negotiators visit the institution to arrive at a mutually satisfactory understanding concerning a plan of work and the cost of the grant, and that thereafter the institution should prepare the proposal in final form and forward it to you for review and clearance.

This will advise you that on November 16, Messrs S.B.Detwiler, Jr., and E.R. DeMoss of our negotiating team visited Anand and reached agreement with officials of the Kaira District Co-operative as to technical and financial details of the proposed grant. It is my understanding that the Co-operative will send you a complete proposal, reflecting the results of the discussions, within the near future.

Sincerely yours,

Horace J. Davis
Agricultural Attache

cc: Secretary, Department of Agriculture,
Government of Gujarat, Ahmedabad
Mr. V. Kurien, General Manager,
Kaira Dist. Co-op. Milk Producers' Union, Ltd., Anand.
Mr. H.W. Marston
Mr. S.B. Detwiler, Jr.

SBDetwiler/zb

Attachment 2

NOTES ON THE KAIRA DISTRICT COOPERATIVE MILK PRODUCERS' UNION, LTD.

(The Cooperative was visited also by John H. Martin, on November 14, 1959. See his trip report, pp. 18-19.)

General

The Kaira District Cooperative Milk Producers' Union is a commercial plant for processing buffalo milk, located near the town of Anand in Kaira District, Gujarat State. Milk for the enterprise is supplied by some 45,000 farmers organized into 190 village cooperatives that are spread over a considerable area of Kaira District; through a system of shareholding, these farmers own at least a substantial portion of the enterprise.

Fluid milk produced at the plant is sold chiefly to the City of Bombay in connection with the Bombay Milk Scheme. Additionally, various milk products, including butter, ghee, nonfat dry milk, dry whole milk, sweetened condensed milk, cheese, baby food, and casein are produced for sale on an India-wide basis.

The Union is perhaps the largest and most successful cooperative enterprise in India, and the plant may well be the most modern of any sort.

History

The original stimulus for the Kaira Cooperative was provided in 1942 by the late Sardar Vallabhbhai Patel, leader of the conservative wing of the Congress Party, who asserted that "the dairy industry of Kaira District must be organized along cooperative lines if it is to thrive and develop to its fullest extent." Patel's interest in the matter presumably stemmed from the fact that he was born in a village near Anand. He is revered today for the guidance that he gave to the movement up until the time of his death in 1950.

In 1945, the Bombay government* instituted a milk scheme for the City of Bombay, which involved collecting surplus milk in the Anand area, pasteurizing it, and distributing it to Bombay consumers. In the initial stages of the scheme, collection and pasteurization of milk were left to milk contractors and private dairies; accordingly, the good prices offered by the Bombay government did not filter down to the farmers of the Anand area, and this resulted in considerable dissatisfaction.

In January, 1946, a meeting of the farmers of the Anand area was held under the chairmanship of Morarji Desai, then general secretary of the Gujarat Provincial Congress Committee (now Minister of Finance of the central government). A scheme for setting up village milk producers'

*Meaning Bombay State, which recently was subdivided into Maharashtra State (including Bombay City) and Gujarat State (including Anand, and with capital at Ahmedabad).

cooperative societies, and a central dairy to be run by a union of these societies, was decided upon; this marked the beginning of the Kaira District Cooperative Milk Producers' Union.

For the setting up of a pasteurizing unit, President Rajendra Prasad (then the central government's Minister for Food and Agriculture) made available part of the buildings of the government research creamery in Anand. Some old machinery belonging to the central government was leased, and some new machinery was purchased. In June, 1948, the dairy made a modest beginning by pasteurizing 500 pounds of milk daily, this representing the output of two village cooperatives. The subsequent growth of the Union is indicated by the following figures for recent years:

Year	Co-ops	Farmer Members	Milk Collected	Value of milk and products sold	Profit	Bonus to Co-ops
			1,000 lbs.	Rs 1,000	Rs	Rs
1955-56	64	22,828	24,500	7,436	296,127	48,390
1956-57	107	26,795	31,200	8,947	203,395	57,460
1957-58	130	29,003	46,600	13,414	1,046,055	246,413
1958-59	138	33,068	60,700	21,165	1,442,401	344,191
1959-60*	167	40,181	50,500	18,216	93,566	17,819
Nov. 1960	190	±45,000				

*Drop in production due to heavy monsoon rains; also, a higher price was paid for milk, resulting in smaller profit and bonus.

By 1953 it was found that the Bombay Milk Scheme could not absorb all of the milk provided by the increasing number of cooperatives; the situation was complicated by the fact that production in the flush winter season is 2.5 times as great as in summer. To assure the area farmers of a stable, year-around market, therefore, it was decided to build a new plant, at the present location outside Anand, with facilities for handling milk products as well as fluid milk. The cost was set at Rs 5 million ($1.06 million).

The cornerstone of the new plant was laid by President Prasad in November, 1954. By dint of extraordinary efforts, the building was completed in 11-1/2 months, and declared open by Prime Minister Nehru on October 31, 1955 (Patel's birthday).

UNICEF contributed Rs 800,000 to the plant, with the proviso that fluid or dry milk valued at 1.5 times the gift should be distributed free over a five-year period, to needy children and pregnant mothers of the area. (At last report, 6 ounces of milk were being distributed daily to 16,000 children in 48 member villages.) New Zealand contributed Rs 300,000 worth of equipment under the Colombo Plan, half of this being a gift and the rest an interest-free loan. And the Bombay government made a loan of Rs 1.0 million.

In 1958 the plant was expanded at a cost of Rs 1.5 million ($320,000) to permit manufacture of sweetened condensed milk. And just prior to my visit, an additional extension, costing Rs 3.1 million ($650,000) and intended for the manufacture of baby food and cheese, had been opened by Finance Minister Desai.

Some years ago, the Kaira Cooperative helped to organize a similar, but smaller cooperative milk scheme in the Ahmedabad district, and a dairy plant has been built in that city (it presumably handles only fluid milk). Also, consideration has been given to organizing a cooperative at Baroda.

The enterprise has not lacked influential sponsors. The interest of Patel, Desai, Prime Minister Nehru, and President Prasad has been mentioned. Dr. Prasad was expected to come again in December, 1960, to launch a baby food promotional campaign. Mr. Nehru made a follow-up inspection visit in April, 1960, and was expected again in January, 1961.

The Staff

Chairman of the Union is Tribhuvandas K. Patel, apparently a prominent social worker of this area; I did not meet him. The operating staff is headed by Mr. V. Kurien, General Manager; Mr. H. M. Dalaya, Assistant General Manager; Mr. P. H. Bhatt, Manager for Administration; Dr. J. D. Contractor, Manager for Production; and Dr. I. M. Patel, Quality Control Officer. (Contractor's grandfather was a bridge builder who adopted the designation "contractor" as a formal surname.) All five of these men have degrees from American universities, in science or engineering, and none was older than 40 at the time of my visit; all have been designated as consultants to UNICEF. They constitute an alert, aggressive team that is doing a remarkably fine job.

Other technical people on the staff include 20 technical officers with Indian degrees, a chemist who serves as assistant quality control officer, three other chemists, and sundry engineers and veterinarians.

Dr. G. H. Wilster, a native of Denmark, headed the Food and Dairy Technology Department at Oregon State College until he retired in 1958 to live near San Diego. Finding his pension inadequate, he accepted an appointment as dairy expert with FAO, and was assigned in 1959 to an eight-month tour of duty at the Kaira Cooperative. (Bhat is a former student of Wilster, which perhaps explains the connection.) He was originally sent to advise on the Union's sweetened condensed milk development, but his interests broadened to include butter, cheese, and other products. He returned to Anand in September 1960 for a second tour of indefinite duration.

Dr. Wilster was very helpful in materials and cost calculations, and other phases of our grant negotiations.

During agency review of our project, FAS had raised the question of conflict with Dr. Wilster's activities. I was glad to have his assurance that there was no conflict.

The Village Cooperatives

Buffalo milk for the dairy plant is supplied through village cooperative societies, which have steadily increased in number since the movement was organized; at the time of my visit there were 190 cooperatives, representing 45,000 farmers over an area of about 1,300 square miles. They are not monopolistic, owing their success to good prices for milk, bonus payments from the Union's profits, and numerous fringe benefits. They do not provide a complete livelihood for the farmer members, but rather a supplementary income. To join a village society, individual farmers pay a membership fee of Rs 5 plus a registration fee of Rs 1; a village society joins the Union by purchasing Rs 100 worth of shares in it.

I was taken to the village of Tranol, 8 miles northeast of Anand, to witness the early-morning milk collection. This cooperative has 493 members, of whom 200 (100 men, 100 women) were currently delivering milk; the rest had dry buffaloes. The proportion of buffaloes to owners is roughly 7 to 5. The head of the cooperative is the mayor of the village and a man worth meeting.

The villagers queue up at the collection station, a neat concrete building of two stories and several rooms that cost Rs 13,000 ($2,750). As they pour their milk into the measuring containers, samples are taken for the Babcock fat test, since the payment rate is adjusted to fat content. The current rate of payment is about Rs 0.55 per liter or Rs 0.25-7 per pound. Each villager is paid for his milk on the day of receipt, although there is a savings scheme whereby a certain percentage of the payment is held back to the villager's credit.

The current average fat content of the milk was reported as 8.9 percent. I saw statements indicating that the figure was 7.3 percent in 1951-52, and 7.8 percent in 1959-60.

It is doubtful that all the samples taken are subjected to the Babcock test; more likely, only spot checks are made.

At Tranol, 20 cans of milk are collected each morning, and 17 cans each evening; each can contains 90 pounds or 9 gallons (presumably imperial gallons). The morning milk arrives at the collection station around 7 a.m., within a half-hour of milking, and is delivered by truck to the dairy plant by 8:45 a.m.

In the reports of the Tranol cooperative, I noted that in 1951-52 it had 89 members and made a profit of Rs 7,000, which amounts to Rs 78 ($16.60) per member; in 1959-60, with 493 members, the profit was Rs 20,000, or Rs 40 ($8.60) per member. This is not a bad sideline source of cash, in a country where the per capita income was only recently raised to $66 per year.

The Union has provided numerous services designed to improve the living standards of the villagers and the quality of the milk produced. These include the sanitary milk collection buildings already mentioned; milk

testing equipment; concrete cattle standings near the houses of members; diesel pumps to provide water for drinking, cattle, and irrigation; a first-aid box in every village with a man trained to use it, and mobile veterinary dispensaries available if needed; an artificial insemination service; bulldozing of truck roads for milk collection; and rehabilitation of village pasture lands. These services are financed partly by the Union and the local cooperatives, and partly by annual grants from the Bombay Milk Scheme.

Extension services are provided by the Agricultural College at Anand. At the time of my visit to Tranol, a group of senior students was making a survey of the agricultural condition of the village; as a part of his assignment, each student had to choose 12 families at random from different castes and report in detail on their land and cattle holdings, acreages planted in different crops, yields, fertilizer practices, etc.

The Dairy Plant

As previously indicated, the dairy plant is up to date as concerns both building and equipment. The main part of the building was completed in 1955, and extensions were added in 1958 and 1960.

The plant was designed to receive and pasteurize 300,000 pounds of milk per day. In 1959 it was actually handling 100,000 pounds daily during the summer and 250,000 pounds daily during the winter; of this, 80,000 to 120,000 pounds of fluid milk were being sent to Bombay in railway tankers, and the rest was being processed. On the day of my visit, the collection was stated to be 180,000 pounds.

Products produced are butter, ghee, pasteurized cream, nonfat and whole dry milk powder, sweetened condensed milk, cheese, baby food, casein, and possibly lactose. The baby food has more or less the same composition as the condensed milk, except for added vitamins and minerals, but appears to be a roller-dried powder rather than a fluid. The products are marketed under the trade name "Amul",an acronym for "Anand Milk Union, Ltd.," which is a synonym for Kaira District Cooperative Milk Producers' Union, Ltd.; Amul also is an Indian word for "priceless."

Milk is brought in by truck to one of two receiving lines, where it is evaluated organoleptically and samples are taken for Babcock tests by both the plant's control laboratory and the Bombay government; results of both tests must tally within 2 percent. Both receiving lines are used for the morning milk collection, and only one at night.

The milk is dumped from the cans into automatic weighers, whence it goes to the raw milk tanks. The cans, which are owned by the plant, are chemically cleaned and steamed before being sent back to the villages; once a week they are hand-scrubbed to follow up on the chemical cleaning.

From the raw milk tanks the milk goes to the pasteurizers, of which there are apparently two, once being a Silkeborg pasteurizer with temperature controlled within ±0.5°(F.?). One pasteurizer was a gift from UNICEF. From the pasteurizers, the milk goes to one of eight insulated holding tanks, each of 30,000 pounds capacity. These tanks may be used for storing not only the regular buffalo milk, but also milk that has been standardized down to the fat level used in dairy products.

From the holding tanks, milk for the Bombay market is pumped to insulated tank cars having a capacity of 30,000 pounds of milk. These cars were Colombo Plan gifts to Maharashtra State; they are not the property of the Kaira Cooperative. Great care is taken to keep them clean. As to the shipping schedule, Monday night's milk is loaded into the tank cars on Tuesday morning, is shipped out on Tuesday afternoon, and arrives in Bombay (266 miles away) on Wednesday morning.

Some fluid milk is sold also in Ahmedabad, a lesser distance to the north, and other towns.

Milk for processing may be sent from the holding tanks to the centrifugal cream separators, of which there are three, apparently identical; one bore the label "Alfa Laval, Stockholm." According to the plant flow diagram, the milk may be separated either before or after pasteurizing.

Cream from the separators is deodorized in a vacreator, a gift from New Zealand under the Colombo Plan. Thence it goes through coolers to the cream ripening vats. From here it goes to two large churns, one of which was about 5 feet long and 5 feet in diameter, rotating on a horizontal axis. The butter goes to an automatic packaging line, and is packed in 100-gram, 200-gram, and one-pound paper packs, as well as in tins.

Ghee is produced from some of the butter. The ghee pan for melting down the butter, and storage facilities are located in a separate building. I gathered that the flavor of ghee is due to diacetyl, which is formed at some time during the process.

Cheese is made in vats of 5,000-liter (1,320-gallon) capacity. Processed cheese was being packaged in paper and tins, with German-made equipment. I saw no evidence that natural cheese was being produced for sale, although Dr. Wilster has been working in this field.

Casein is made from off-grade milk. I noted two casein-precipitating vats, about as large as our experimental cheese vats at Beltsville.

Milk for condensed or dry milk is concentrated in a double-effect evaporator. I did not inspect the sweetened condensed milk operation; however, milk powder is produced in a standard cyclone spray drier. Apparently both skim milk and whole milk powders are produced. The latter is standardized down to 26 percent fat on a dry basis. It is double-nitrogen-packed in 5-gallon tins, and carries a 6-month guarantee. Dr. Carpenter advised that he had had only 3 percent rejects on the whole milk powder, although he indicated that Indian consumers were probably not as critical as American consumers.

[illegible] milk cans [illegible] to the weigh-in [illegible], of which there [illegible] only two, one being a Sillimore [illegible] with temperature [illegible] +6.5°C [illegible]. One [illegible] from [illegible] [illegible], [illegible] goes to one of eight insulated holding [illegible] of 5,000 pound capacity. These tanks may be used for storing the regular buffalo milk, but also milk that has been standardized to the fat level used in other products.

[illegible] holding tanks, [illegible] the Bombay market is piped to insulated [illegible] having a capacity of 20,000 pounds of milk. These tanks were [illegible] given to [illegible]; they are not the property of [illegible] cooperative. [illegible] is [illegible] than clean. At [illegible] screening, Bombay milk [illegible] its [illegible], is [illegible] afterwards, and [illegible] in [illegible] milk's area) on [illegible] evening.

[illegible] milk is [illegible], a [illegible] [illegible].

[illegible] may be [illegible] from the holding tanks to the [illegible] separators, of which there are three, apparently [illegible] ones, [illegible] the label "Alfa-Laval, [illegible]." According to the plant [illegible], the milk may be separated either before or after pasteurization.

[illegible] from the separators is neutralized in a vacreator, a gift from [illegible] Zealand under the Colombo Plan. Thence it goes through coolers [illegible] the cream ripening vats. From here it goes to two large churns, [illegible] which was about [illegible] feet long and 5 feet in diameter, rotating [illegible] horizontal axis. The butter goes to an automatic packaging line. [illegible] is packed in [illegible], [illegible], and one-pound paper packs, as well [illegible] tins.

[illegible] produced from [illegible] of the butter. The ghee pan for melting down [illegible], and [illegible] are located in a separate building. [illegible] the flavor of ghee is due to [illegible], which is [illegible] during the process.

[illegible] like [illegible] called [illegible]. [illegible] packaged in paper and tins, with [illegible] containers. [illegible] once that [illegible] cheese was being produced [illegible] has been working in this [illegible].

[illegible] made from [illegible] milk. I noted two [illegible] [illegible] as [illegible] cheese vats at Beltsville.

[illegible] of [illegible] milk is concentrated in a double-effect [illegible]. I did not inspect the sweetened condensed milk operations; [illegible] milk powder is produced in a standard cyclone spray drier. Both skim milk and whole milk powders are produced. The [illegible] standardized down to 26 percent fat on a dry basis. It is [illegible]-packed in 5-gallon tins, and carries a 6-month guarantee. [illegible] advised that he had had only 3 percent rejects on the [illegible], although he indicated that Indian consumers were probably [illegible] as [illegible] consumers.

Baby food is the latest addition to the line of milk products. The baby food section is located in a new wing of the plant, which at the time of my visit had been equipped but was apparently not in full commercial operation. This section is air-conditioned with filtered air. The equipment includes an electronically-controlled pasteurizer, a single-pass falling film evaporator, and roller driers. Elaborate precautions are taken to insure cleanliness.

The baby food is essentially a sweetened condensed milk in powdered form, with added vitamins and minerals. Initially it will be packed under nitrogen in 500-gram tins; a 1-kilo tin will be introduced later. The formula, developed by the Central Food Technological Research Institute at Mysore after five years of work, is intended for the requirements of babies in tropical climates; it has been recognized by the Indian Standards Institution. The advertised composition per 100 grams of powder is as follows:

Protein	22.0 g
Fat	18.0 g
Carbohydrate	52.0 g
Calcium	1.0 g
Phosphorus	0.8 g
Iron	4.0 mg
Vitamin A	1500 IU
Vitamin D	400 IU
Vitamin C	30.0 mg
Vitamin B_1	0.6 mg
Vitamin B_2	1.0 mg
Vitamin B_6	0.3 mg
Niacinamide	6.0 mg
Calories	471

A promotion campaign was to be launched on December 15, at ceremonies to be attended by President Prasad. This campaign was to be initially directed at Gujarat and Maharashtra States and Delhi City, although country-wide distribution of the product will be sought as soon as possible. Advertising was planned in 16 medical journals, 45 general press media, films at 87 theaters, dealer displays, and mailings to physicians.

Returning now to the plant inspection, the analytical laboratory is well equipped for Babcock fat tests and other routine tests needed by the plant.

In the planning of the Cooperative, some consideration was given to lactose production, but I saw no evidence that it was actually being produced.

Mention has been made of plant equipment provided by UNICEF, and by New Zealand under the Colombo Plan. TCM also has been interested in providing equipment for the Cooperative--for example, a chilling center. State government red tape had delayed receipt of the equipment at Anand, and it was not clear whether it had actually been installed at the time of my visit.

Subsidiary Enterprises

As part of its program to improve the condition of Kaira District buffaloes and their owners, the Cooperative has projected a feed concentrate plant. Currently, the local farmers feed whole cottonseed to their cattle as a supplement to pasteurage; this appears to have a scouring effect upon the cattle. The Cooperative expects to buy up the cottonseed, express and sell the oil, and sell the cake, mixed with other nutritives, back to the farmers.

Limes are grown by the local farmers. The Cooperative has set up a small plant for producing lime oil, which will be run on a cooperative basis.

A similar small cooperative plant is planned for the production of banana powder, which has a ready market in India.

Comments

The organizers and operators of the Kaira Cooperative deserve much credit for having developed an enterprise that not only makes money, but returns a considerable portion of the profits to the local farmers, in the form of cash and other material benefits. Also, prominent Indian economists have predicted, over the years, that buffalo milk could not be economically processed into dairy products; but the Cooperative refused to be dismayed by these predictions.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D.C.

March 22, 1961

TO: Guido E. Hilbert, Director, Foreign Research and Technical Programs Division

FROM: Samuel B. Detwiler, Jr., Special Assistant to the Administrator

SUBJECT: Foreign Travel, 1960 - Report No. 4
India: National Chemical Laboratory, Poona (November 18-19)

Mr. E. R. DeMoss and I visited the National Chemical Laboratory, Poona, on November 18 and 19, 1960. We held discussionswith all but one of the following persons, who constitute the principal research staff of the organization:

Dr. K. Venkataraman, Director
Dr. R. C. Shah, Deputy Director
Dr. Sukh Dev, Assistant Director in charge of the Organic Chemistry Division
Dr. V. Jagannathan, Assistant Director in charge of the Biochemistry Division
Dr. A. B. Biswas, Assistant Director in charge of the Physical Chemistry Division
Dr. S. L. Kapur, Assistant Director in charge of the Polymer Chemistry Division
Dr. M. U. Pai, Assistant Director in charge of the Chemical Engineering Division
Dr. S. C. Bhattacharyya, Assistant Director in charge of the Essential Oils Division
Dr. J. Gupta, Assistant Director in charge of the Inorganic Chemistry Division (did not meet)
Dr. K. G. Mathur, Assistant Director in charge of the Survey and Information Division

Grant Negotiations

Principal purpose of this visit was the negotiation of a grant based on the Approval Copy of the following project:

UR-A7-(40)-12
Investigation of the effect of heat on tung oil and derivatives of tung oil, and the characterization and identification of compounds resulting from heat treatments, to extend the utilization of tung oil.

This project had been developed by Utilization Research as a counter-proposal to a proposal previously submitted by the NCL Chemical Engineering Division, concerned with the continuous catalytic hydrogenolysis and hydrogenation of inedible fats (see below under Other Research Proposals).

The project was discussed at a meeting of staff leaders in the Director's office, and assigned by Dr. Venkataraman to Dr. Sukh Dev of the Organic Chemistry Division. After an hour's review of the project, Dr. Sukh Dev expressed interest in undertaking the work, and indicated that he was entirely satisfied with the plan of work as we had written it. He named himself as the principal investigator. Fiscal negotiations were thereupon conducted by Mr. DeMoss with Dr. Sukh Dev, who indicated that as an Assistant Director, he was authorized to clear the general grant provisions and to develop the cost estimates. Total negotiated cost was Rs 242,500 (about $51,000).

As concerns the tung oil needed for the work, Dr. Sukh Dev indicated that he could procure the samples locally.

Tung production in India amounts to about 70 to 80 tons annually, while imports amount to perhaps 150 tons. NCL is currently interested in research on tung oil substitutes.

It was made clear to Dr. Sukh Dev and others at NCL that grant negotiations were subject to clearance by the Damle Committee at New Delhi. (Presumably, also, they are subject to clearance by the Council of Scientific and Industrial Research.)

Dr. Sukh Dev agreed to prepare a proposal corresponding to our project, using our title, objective, and plan of work verbatim. To avoid misunderstandings, I left him a skeleton outline of the proposal, having filled in the critical paragraphs; also, for the information of the Damle Committee, I provided for indication that a grant had been negotiated by Mr. DeMoss and me. To date I have not seen the proposal.

Dr. Sukh Dev was formerly on the staff of the Department of Organic Chemistry at the Indian Institute of Science in Bangalore, under D. K. Banerjee; he came to NCL only recently. I consider that, like all the NCL division heads with whom I talked, Dr. Sukh Dev is an able research worker and administrator. He has excellent physical facilities in the Division, although for the purposes of our grant research he will need certain special equipment, namely, infrared and ultraviolet spectrophotometers, a gas chromatography apparatus, and a high-vacuum fractional distillation unit. Since the staff of the Division comprises about 100 organic chemists, recruitment of personnel for the work should not enter into the picture.

I do not recall that anyone at the Laboratory expressed uncertainty about ability to get foreign exchange clearance to buy the special equipment needed.

In passing, "Sukh" and "Dev" are the gentleman's two given names; his surname is Lala. I was advised that he comes from the Punjab, where, apparently, it is fairly common to discard one's surname.

Together with copies of this report, Dr. Oman in New Delhi is being provided with a setup including copies of project UR-A7-(40)-12, the original chemical engineering proposal, and pertinent background correspondence.

Status and Indicated Action. - Reports of fiscal and technical negotiation are in preparation by Mr. DeMoss and myself, respectively. The Approval Copy of the project is ready for signature whenever appropriate. I have reminded Dr. Venkataraman (in my current acknowledgment letter, Attachment 3) that if the proposal has gone forward to New Delhi, we should like to have an information copy; or if it has been delayed, we should like to know about it. No further action in Washington is indicated until the cleared proposal has been received and found to be in good order.

It is suggested that Dr. Oman determine whether the proposal is in the hands of CSIR or the Damle Committee, and if so, to attempt to facilitate its clearance. If it is not yet in New Delhi, he might after a reasonable time take appropriate follow-up action with Dr. Venkataraman.

Other Research Proposals from the Institution

The Wood Extractives Proposal. - As was the case elsewhere, one particular P. L. 480 proposal had made the greatest impression on the Director. This was the wood extractives proposal, which had been submitted by NCL in late 1959 under the title, "Chemical investigations of the wood extractives of the various species of Dahlbergia Linn., fam. Leguminosae." It was referred to Utilization Research, which assigned the number UR-A7-(00)-d, considered it in January 1960, and dropped it chiefly as lacking commodity interest.

In our opening discussion, Dr. Venkataraman asked about the status of this proposal, and I advised him that it had been unfavorably considered. While in no sense resentful, he quite plainly was keenly disappointed at the news. It then developed that the proposal is in the field of Venkataraman's personal research interests, which over a long and distinguished career have been concerned with natural pigments, dyes, and synthetic dyestuffs; that by the terms of his contract he is permitted to spend an appreciable portion of his time on these interests, instead of on administrative paperwork; that in consequence, he maintains a Director's Research Laboratory under his immediate supervision; and that as concerns a P.L. 480 grant, he is not devoted to Dahlbergia spp., but would be willing to work on any woods that our American scientists considered of interest.

Later the same day, I reported these events by memo to Mr. Marston in New Delhi (Attachment 2), suggesting that Forest Service be given an opportunity to consider the proposal, if it had not already been so referred. Recently, I learned from Mrs. Cook that the proposal was sent by FRTPD to FS on 12/8/60; that FS disapproved it under date of 1/25/61, with indication that it might later propose other lines of work; and that Mr. Marston passed this information to Dr. Venkataraman in his letter of 2/7/61.

It is suggested that early consideration be given to development of a justifiable problem that falls within the sphere of Dr. Venkataraman's interests as outlined above. Such action might do much to facilitate the evolution of an extensive P.L. 480 program at NCL.

(Note: Since the foregoing was prepared, Dr. Venkataraman's research interests have been discussed with the Utilization Review Panel. The Panel suggested several topics in the field of utilization research, that might suitably be undertaken by the Director's Research Laboratory at NCL. Consideration will be given to developing Research Problems on these topics, and to bringing these Problems to Dr. Venkataraman's attention, through channels, in due course.)

The Inedible Fats Proposal. - The fact that we had negotiated the tung oil project with Dr. Sukh Dev was no consolation to Dr. Pai of Chemical Engineering, who was disappointed that we had dropped his proposal, which had the two-pronged title, "Continuous catalytic hydrogenolysis of ethyl esters of fatty acids derived from inedible fats. . . . ; continuous catalytic hydrogenation of unsaturated glycerides in inedible fats . . ." (our numbers A7-e and A7-f). The fats that he had proposed to work on (pisa fat, cocum butter, neem oil, mowrah oil, etc.) have no practical interest to us. However, it developed that Dr. Pai is less concerned with the particular fats used than with the elucidation of process kinetics in continuous reactions of various types, including hydrogenation and hydrogenolysis of oils. I gave Dr. Pai no hope that we might reconsider his proposal. However, I do feel that we might establish more clearly the position of chemical engineering process studies in the P.L. 480 program. This will be discussed with Dr. Irving and others in UR&D.

Pisa fat, by the way, will doubtless never be important as a U. S. crop; but as a scientific curiosity it deserves a side note. This comes from the fruit of a tree, Actinodaphne hookeri, that grows in various parts of India, particularly the Bombay region. The seed contains about 45 percent of fat.

The first chemical studies of Actinodaphne hookeri appear to have been made by S. Krishna and coworkers of the Forest Research Institute at Dehra Dun, in connection with an alkaloid (actinodaphnine) that occurs in the bark of the tree (J. Ind. Chem. Soc. 9, 429 (1932)). This work led them to examine the seed fat (ibid. 10, 395 (1933) and 11, 711 (1934)), which they found to contain about 95 percent lauric acid, in the form of trilaurin. The possibilities for producing lauryl alcohol at once suggested themselves.

I find nothing on pisa fat in the literature since the work of Krishna, and it is mentioned in few of the standard reference works. However, new interest among Indian scientists appears to have been stimulated by recent emphasis on the utilization of native raw materials. During my current trip I learned that pisa fat is being studied at NCL, by Dr. Kane at the University of Bombay, and by workers in at least one or two other institutions. Dr. Pai states that the trees of the Satara District, in the Bombay region, yield about 200 tons of the oilseed; and he suggests the possibility of establishing plantations.

The Dissolving Pulps Proposal. - For my information, Dr. Pai showed me a copy of another P.L. 480 proposal that had just gone forward to New Delhi under the title, "Studies in continuous pulping of tropical cellulosic raw materials for producing dissolving grade pulps." His major interests in this work would involve the utilization of hardwoods and bamboo, and improvements in the technology of mixed wood pulping; some attention would be given to the utilization of agricultural residues.

(Note: This proposal is now at hand in Washington, and is undergoing review by FS (under the number A7-FS-9) and UR&D (under the number UR-A7-(00)-23).)

Research Problems Suggested by UR&D

I discussed with Dr. Venkataraman and others a half-dozen Research Problems (skeleton projects) that had been developed by UR&D for consideration by NCL and other institutions. They refused some of these outright, and kept others for further examination.

(1) In his letter of December 1 to me at New Delhi, Dr. A. B. Biswas of Physical Chemistry expressed interest in undertaking certain aspects of Research Problem UR-RP-N-(10)-2, "Rheological studies on modified cereal starches by investigating the changes in flow characteristics during the paste preparations, and at high shear rates after pasting," etc. Accordingly, in my current acknowledgment letter to Dr. Venkataraman (Attachment 3) I am suggesting that NCL prepare and submit a complete research proposal, outlining the plan of work in some detail. We have given it the project number UR-A7-(10)-29.

(2) Dr. Biswas expressed tentative interest in Research Problem UR-RP-S-(21)-6, "X-ray study of crystallite orientation and spiral angle in native and chemically modified cottons" etc. However, he suggested that I give the first refusal to Dr. G. N. Ramachandran, head of the Physics Department at Madras University. (I did later discuss the Problem with Dr. Ramachandran, who was unwilling to undertake it himself, but volunteered to refer it to Dr. T. Radhakrishnan in the laboratories of the Ahmedabad Textile Industry Research Association, Ahmedabad. To date I have heard nothing further on the subject from either Dr. Ramachandran or Dr. Radhakrishnan. However, it should be noted that Radhakrishnan recently sent us a proposal on a different aspect of cotton research, that is being handled separately under the number UR-A7-(20)-19.)

In his letter of December 1, Dr. Biswas indicated that he was more interested in other aspects of fundamental cotton research (see below under Other Research Ideas). In my acknowledgment letter I have apprised Dr. Venkataraman of the situation; however, I do not expect that anything will come of Problem S-6 as far as NCL is concerned.

(3) For the record, I discussed two other Research Problems with Dr. Venkataraman, but elicited no interest. One was UR-RP-N-(40)-9, on a high-protein food product made by alcohol-water extraction of soybean meal, which Dr. Venkataraman said was in the province of the Central Food Technological Research Institute at Mysore. The other was UR-RP-S-(21)-3, on new solvents for molecular weight determination of cellulose; this, however, will probably be placed at the University of Bombay (see Report No. 2).

Dr. Sukh Dev expressed tentative interest in two other Problems, but later decided that for lack of space facilities, he ought not consider anything but the tung oil grant for the time being. These were UR-RP-S-(21)-4, on aziridinyl phosphorus compounds, and UR-RP-S-(21)-5, on positions occupied on the glucose units by substituents of chemically-modified cottons.

Other Research Ideas

Suppression of Water Evaporation. - One of NCL's major interests is the development of new compounds that will form monomolecular films on the surface of reservoirs and other large bodies of water, to reduce evaporation losses. I understand that the problem has attracted considerable attention in the United States during recent years. It is perhaps even more important in India, where water is harder to come by.

An effective evaporation suppressant should have a low melting point (around 50°C.) to enable it to spread rapidly on the water surface, so that breaks caused by wind and waves will be readily healed; a large equilibrium film pressure at the temperatures of water surfaces usually encountered; and a stable, incompressible, condensed film. Cetyl alcohol meets the desiderata fairly well, either alone or mixed with stearyl alcohol; but laboratory tests at NCL have indicated that there is considerable room for improvement.

After reviewing the possibilities of various classes of compounds (higher homologues of cetyl alcohol, unsaturated alcohols, etc.), Dr. Biswas and his coworkers in the NCL Physical Chemistry Division have produced a series of compounds $CH_3(CH_2CH_2)_n$-O-CH_2CH_2OH (or, for short, R-OEtOH), by reaction of the bromides of myristyl, cetyl, stearyl, and behenyl alcohols with monosodium glycolate. These compounds, they find, are considerably superior to cetyl alcohol in their ability to spread fast and heal surface breaks and, generally, to reduce evaporation; some of them have improved the reduction of evaporation by at least 30 percent in both summer and winter.

A related series of compounds R-$(OCH_2)_n$-OH also have been prepared by condensation of ROH with ethylene oxide.

The results of this work were recently published in Nature (September 3, 1960, page 870).

Dr. Biswas has been able to keep only two men on this work, and is not progressing as fast as he would like. So far, he has made small-scale field trials of his compounds in 4- and 8-foot pans; now, if he had the facilities and funds, he would like to go into larger-scale tests in lakes and reservoirs. When Dr. Biswas raised the question of a P. L. 480 grant for such work, I advised him that the matter would be brought to the attention of Soil and Water Conservation Research.

(Note: Recently I mentioned this idea briefly to Dr. Pate of SWC in a phone conversation. It is suggested that a marked copy of this report be sent to them for further consideration.)

In subsequent discussions with Dr. Biswas, it occurred to me that UR&D might properly sponsor research on the development of new compounds in the foregoing series, using common vegetable oils or animal fats as raw materials, and on determination of their physico-chemical properties. I have advised Dr. Venkataraman (Attachment 3) that we would attempt to prepare a project on this subject. (This has been given the project number UR-A7-(40)-28.)

Cotton Cellulose Research. - Dr. Biswas has indicated his interest in such phases of cotton cellulose research as the crystallite size and distribution in the fiber matrix, surface area and reactivity of cellulose, and molecular weight distribution, etc. We have suggested (Attachment 3) that he prepare detailed proposals for such work.

Other. - Dr. Jagannathan of Biochemistry would be interested in microbial conversion of terpenes to useful chemicals. I suggested that he prepare a skeleton proposal for our consideration.

Attachment 1 - Notes on the National Chemical Laboratory
Attachment 2 - Memo of 11/18/60, Detwiler to Marston
Attachment 3 - Acknowledgment Letter, Detwiler to Venkataraman

Attachment 1

NOTES ON THE NATIONAL CHEMICAL LABORATORY

(The Laboratory was visited also by J. F. Saeman on November 6, 1959. See his memorandum to The Record dated January 22, 1960.)

General

The National Chemical Laboratory is one of numerous institutions (currently 26) controlled by the Council of Scientific and Industrial Research. It was established in 1949 with Professor James W. McBain (1882-1953), professor emeritus of Leland Stanford University, as its first director.

Professor McBain left the Laboratory in 1952, before the physical plant had been completed. During his tenure he established the institution's organizational pattern, with a strong accent on physical chemistry.

Second director of NCL was Professor G. I. Finch, who apparently remained until 1957, when Dr. Venkataraman was appointed to the post. Dr. Venkataraman came from the University of Bombay, where he had been director of the Department of Chemical Technology.

The objective of NCL, according to a statement by Professor Finch, "is to advance chemistry and its application to industry in India. This involves the prosecution of research in all fields of chemical science and technology, creating new knowledge, developing new processes to suit indigenous conditions, training of experts in chemical technology, and the dissemination of knowledge for application by industry. Thus, in brief, the steps are: exploration and recognition of needs, discovery, practical development and, finally, application."

Dr. Venkataraman implied to me that the foregoing objective is currently subject to certain limitations. He stated that NCL does no food research, which is in the province of the Central Food Technological Research Institute at Mysore, and that it does no work on the technology of vegetable oils, which is in the province of the Regional Research Laboratory at Hyderabad. (Both CFTRI and the RRL, like NCL, are CSIR organizations.) However, NCL does conduct basic research in vegetable oils, as in many other fields.

The Laboratory stands on a large tract several miles outside Poona; houses for perhaps 25 percent of the staff also are located on this tract. The grounds adjoining the Laboratory are beautifully landscaped. The main building has two full floors, with a third floor over the center portion. It is built in a line, without wings; but floor for floor, at a guess, the square footage is about the same as in our Regional Laboratories.

I was given the following rough figures on personnel:

Total personnel, 650 to 700; scientific staff, 350 to 375. Organic chemists, 100; biochemists, 50; physical chemists, 50; polymer chemists, 30; inorganic chemists, 35; chemical engineers, 50; Survey and Information (a program evaluation group), 20. (These figures add up to 335; they do not account for the Essential Oils Staff, which at a guess numbers 30 scientists.)

As previously indicated, Dr. Venkataraman's personal research interests are in the fields of natural pigments, dyes, and synthetic dyestuffs, and his contract with CSIR permits him to pursue these interests in his present post. Work in these fields is conducted in a laboratory which, while housed with the Organic Chemistry Division, is under the director's immediate supervision. There are two reasons why Dr. Venkataraman is able to enjoy this pursuit. First, he delegates much of the administrative load to his deputy and the assistant directors. Second, he lives in a spacious, well-furnished apartment on top of the Laboratory building, and hence, with suitable rest periods, is able to spend a long day at work.

Dr. Venkataraman's contract also will permit him to work until 65 years old, although the standard retirement age for Indian scientists is 60 years.

Dr. Venkataraman expected to spend four months as a visiting professor at Purdue University in the first part of 1961.

In reviewing the Laboratory's program, I noted what appeared to be a good balance between fundamental and applied research. However, I sensed that the practical end-objective was never far from each researcher's thoughts This was rather generally the case at most of the institutions that I visited. It stems from the great emphasis that is being placed on "indigenous raw materials", in an effort to improve India's economic position by reducing the outflow of foreign exchange for imports.

This attention to the end-objective is reflected in CSIR's annual reports for NCL and other institutions, which go to some pains to list processes and products utilized by industry, processes released for commercial development, processes released free, and processes ready for industrial utilization. Emphasis is given also to taking out patents for the various developments.

Some of the Laboratory's research concerns commodities of no interest to us. And some of it concerns developments that in the United States might be dismissed with the stock evaluation, "technically feasible, economically unsound." In India, these developments may not be economically unsound. An example is sugarcane wax, which is being studied with serious interest not only at NCL but also at CFTRI in Mysore, at the Central Leather Research Institute in Madras, and at another institution whose name is not at hand. It is not an improbable guess that before this work is finished, some Indian manufacturer is going to make money out of sugarcane wax--perhaps as an ingredient of shoe polish, or perhaps as a coating to reduce moisture losses in stored apples.

I visited five of the eight divisions in company of the assistant director in charge of each. Without exception, each assistant director showed an impressive grasp of the problems he was trying to solve. Taken together, they constitute a talented group. If this point is not reflected in the following discussion, the fault is mine for having let my notes grow cold.

Organic Chemistry Division

Dr. Sukh Dev, Assistant Director in Charge

The Oils and Paints Section is doing no work on oilseed technology, since this falls within the province of the Regional Research Laboratory at Hyderabad; however, it is much concerned with the fundamental chemistry of fats and oils.

One of its interests involves kamala oil, extracted from the pods of the tree of the same name (*Mallotus philippinensis*). Kamala seeds contain about 35 percent oil, which contains over 55 percent kamlolenic acid (18-hydroxy eleostearic, or 18-hydroxy-9,11,13-octadecatrienoic acid). Kamala oil air-dries to a wrinkle finish, and is considered a good tung oil substitute. Also, the terminal hydroxyl can be oxidized to give a C-18 dicarboxylic acid. NCL is working on such problems as minimizing the gelling tendency of the oil during storage (e.g., by adding small amounts of benzene; it can also be stored as a urea adduct). . . Kamala pods are coated with an orange-red powder that has long been known as a dye for silk and wool, and as an anthelmintic and purgative.

Other work on vegetable oils concerns the production of lubricants, development of optimum conditions for preparing long-chain alcohols from inedible fats, and preparation of sulfonated *n*-laurylbenzene and evaluation of its detergent properties.

In the Chromatography Section, a small group is working on improved methods for isolating alkaloids (e.g., morphine, codeine, papaverine, thebaine) from opium. This section also is interested in improving present commercial processes for producing sebacic acid from castor oil.

There are three groups in the Fine Chemicals Section. One is working on the solvent extraction of byproduct wax from a fiber plant (*Agave* sp., probably sisal). The fiber waste contains up to 18 percent of a wax that may be a good substitute for carnauba.

Another group has been working on the production of vitamin B_6 (pyridoxine hydrochloride); I understood that this work was a major pursuit of Dr. Shah (present deputy director) when he was head of Organic Chemistry; an improved process has been handed over to Chemical Engineering, where it is in the pilot plant stage.

India annually imports 450 kg. of pyridoxine hydrochloride, valued at about Rs 700,000 ($150,000).

Also in the Fine Chemicals Section, two people were expecting to start work on the basic chemistry of lac resin, which appears to have lost most of its former markets (shellac, phonograph records, etc.). They hope to obtain a clearer picture of its constitution, and how to modify it to develop new uses.

I find in my notes that Dr. B. C. Subba Rao, who was with Brown at Purdue, was working on metallic anhydride reductions. Possibly his work is related to that of Dr. M. V. Bhatt of the Indian Institute of Science, who would like to have a P.L. 480 grant on production of long-chain dicarboxylic acids by hydroboration. (See my report No. 5, page 5-4.)

The Section devotes considerable attention to the synthesis of expensive drugs and organic chemicals that are not readily available on the Indian market. Examples are isopropyl alcohol; N-methyltaurine as a dye stabilizer and wetting agent intermediate; progesterone from bile acids; 4-hydroxy-coumarins; and dimethylstilbestrol. Part of this is service work, and part concerns the development of new methods. For example, India has no source of olefinic refinery gases usually used for production of isopropyl alcohol; accordingly, NCL is producing it by catalytic hydrogenation of acetone, on a pilot-plant scale, with yields of 80 to 85 percent.

The Microanalytical Laboratory is claimed to be the best in India. I noted several Mettler single-pan microbalances in use.

The Director's Research Laboratory is under the direct supervision of Dr. Venkataraman, as previously mentioned. Typical activities and accomplishments include (1) isolation of three new pigments from the heartwood of *Artocarpus integrifolia*, and demonstration that one of them is 5,2',4'-trihydroxy-7-methoxyflavone; (2) synthesis of 1,3,8-trihydroxy-2-hydroxymethylanthraquinone and comparison of its properties with certain natural pigments; (3) elucidation of the structure of erythrolaccin, a constituent of shellac; and (4) structural investigations of a new alkaloid found in the fruit of *Capparis monii*, claimed by certain Bombay physicians to have powerful antitubercular activity. The same laboratory is active also in the chemistry of commercial dyes.

The Section on Carbohydrates and Rodenticides was a particular interest of Dr. Shah when he headed Organic Chemistry. In an incidental conversation, Dr. Shah advised that he continued to be interested in 4-hydroxy coumarin as an intermediate for manufacture of rodenticides, e.g., warfarin, tomarin, and fumarin; in this connection he has a new process on which patent applications have been filed in various countries, including UK and the United States.

In one laboratory or another I noted work under way on such subjects as the structure of deodar oil and the synthesis of patchouli oil. Also, work is going forward on the sterols of sugarcane wax; I noted a urea adduct of cane wax crude sterols (stigmasterol, sitosterol, etc.).

The Division is interested in new uses for cashewnut shell liquid, and has produced wetting agents and detergents from two of the components--anacardol and tetrahydroanacardol. (See also under Polymer Chemistry, below.) . . . Cashewnut shells, by the way, contain a skin irritant that is similar in its effects to urushiol, the active principle of poison ivy; the nuts are roasted during processing, to inactivate this principle.

In common with other groups, the Division is interested in neem, which is as much of a curiosity as pisa fat. The neem tree (*Melia indica*) is a common sight in India. Besides being ornamental, it has practical uses--the bark, leaves, and twigs contain an active principle that is used commercially in toothpaste; and the twigs are used by peasants in place of a toothbrush. The active principle, probably a triterpene, goes under the name of "non-nitrogen bitter principles"; NCL is currently working on its structure. The Laboratory is also interested in processing conditions for neem oil, from the seeds of the tree.

Biochemistry Division

Dr. V. Jagannathan, Assistant Director in Charge

The Division has perhaps the largest collection of microorganisms in India, which goes under the name, National Collection of Industrial Microorganisms. Dr. V. S. Krishnamachar is in charge of it. He currently has about 1200 specimens of yeasts, fungi, and bacteria, intended chiefly for use in industrial fermentations and microbiological assay. These are distributed free within India and elsewhere. Subculturing the organisms takes up a considerable amount of time. They are maintained by various methods, including lyophilization and immersion under paraffin oil; the lyophilization apparatus was obtained through TCM.

An all-India list of culture organisms was to have been published shortly after my visit. I requested copies, but have not received them yet.

Collaboration between this group and the NU Culture Collection would appear to be desirable, if it is not already in effect.

Dr. Jagannathan's major interest at present is concerned with the culture of plant tissues from single parenchyma cells, with the objective of obtaining useful byproducts without having to grow the whole plant. I observed carrot and potato cells growing in shake flasks; and Dr. Jagannathan mentioned the growing of tobacco root cells for the production of nicotine, and of belladonna cells for the production of atropine. The process has been scaled up from test tubes to one-liter vessels. Current emphasis is on nutrient media, which must be varied for each kind of culture. With present media, they can get cells to double themselves in a 24-hour period. The efficiency of sugar conversion is 40 percent on a dry weight basis.

These tissue cultures produce no chlorophyll. Dr. Jagannathan hopes some day to grow cells that will carry on photosynthesis, better than algae do.

Dr. Jagannathan indicated that Pfizer in the United States is working in the same field. He expected to discuss his work at a Symposium on Life Sciences, to be held at New Delhi in December 1960, and to publish in the Proceedings of this Symposium.

Dr. Bhatt of this Division is interested in microbial transformations of terpenes, with a view to obtaining useful products from such cheap raw materials as alpha-pinene. He mentioned the case of agarwood (agalloch = Aquilaria agallocha?). Here the healthy plant produces no essential oil; but if infected with a fungus, it produces an oil of use in perfumery. Another example concerns santalin from sandalwood, which has no value; but the corresponding alcohol, santalol, does have uses (e.g., as a urinary antiseptic).

Dr. Bhatt also appears to be interested in the microbial production of cortisone from its precursors; in this connection, the Division has reported work on the production of holarrhimine from kurchi bark, and its conversion to aldosterone.

The Fermentation Laboratory has a battery of six 10-liter vessels for scaling up from shake-flask operations. It also includes a 40-liter fermenter, and a special fermenter for yeast production. Dr. Jagannathan expressed appreciation of the advice that Dr. Saeman had given on this apparatus.

The program of the Fermentation Laboratory includes pilot-scale studies of the production of bacterial diastase, transfusion gelation, and vitamin C from sorbitol.

Jagannathan advised that India does not use yeast commercially at present, although a feed yeast factory is to be built. (At other institutions I received conflicting information as to whether commercial yeast production was in effect or merely contemplated, and whether the yeast was to be used for feed, bread, or brewing.)

The Division has good equipment, much of it obtained through TCM; this includes equipment for ion exchange, chromatography, electrophoresis (a Perkin-Elmer Tiselius outfit) and centrifugation (a Spinco centrifuge). (See also Dr. Saeman's report for a further discussion of equipment.)

Jagannathan spent some time with David E. Green at the Enzyme Institute, University of Wisconsin. Perhaps because of this experience, he is interested in doing fundamental and applied work on the production of industrial enzymes, e.g., amylase and protease. He is already in this field to some extent, as indicated above.

Jagannathan has been working on phosphorus-containing peptides in alpha- and beta-casein. Some of his results had just been published in the Indian Journal of Scientific and Industrial Research, although reprints were not yet at hand at the time of my visit.

The Division has worked on the amino acid composition of structural proteins such as elastoidin and fibroin, and of peptides derived therefrom. It is doing no work on cereal proteins, since this field is handled by the Central Food Technological Research Institute in Mysore.

Jagannathan expects to do some work on the production of tartaric acid, which has considerable use in India but is not available from grapes, since there is no domestic wine industry. He is considering use of either a chemical method or one of three fermentation organisms. Also, he is currently producing 5-ketogluconate from glucose, using an <u>Acetobacter</u> organism.

<u>Physical Chemistry Division</u>

Dr. A. B. Biswas, Assistant Director in Charge

Much of the work of this Division is concerned with solid state chemistry and other fields of little concern to agricultural research. Nonetheless, there are probably as many opportunities for P.L. 480 grants in this Division as in any other at NCL.

The subjects of primary interest to us (evaporation control by surface films, rheological studies of starches, cotton cellulose studies) have been discussed in previous sections of this report.

Equipment in the Division includes an electron microscope, X-ray and electron diffraction apparatus, a good assortment of optical microscopes, light-scattering photometer, analytical ultracentrifuge, Tiselius electrophoresis apparatus, infrared spectrophotometer, viscometers, etc., etc. NCL has a small laboratory for tracer work; and Biswas hopes in the next year or so to get a Co^{60} source.

Under solid state chemistry, the principal lines of investigation are concerned with (1) thermistors (conductivity and other measurements of oxidic semiconductors having a high temperature coefficient of resistance, such as binary systems of manganites, and correlation with structure); (2) dielectric properties of various inorganic materials; (3) production of permanent magnets from sintered ceramic materials; (4) development of piezo-electric crystals; (5) studies of activators for zinc sulfide phosphors; and (6) vacuum metallization of woven fabrics. In this connection, the Division is in a position to do research on the electrical properties of organic plastics.

Some work is going forward on surface-active agents prepared from native raw materials, including study of their detergency and wetting and suspending actions.

In the field of catalysis, fundamental studies have been undertaken on the mechanism of catalytic reactions. On the practical side, a chromic oxide catalyst has been developed for converting turpentine constituents to p-cymene, an industrial intermediate. And a Raney nickel catalyst equivalent to American-produced material has been prepared.

The Division is collaborating with the Chemical Engineering Division in the development of rayon pulps from hardwoods. Biswas' interest lies in correlating the physical chemical properties of the pulps with their suitability for rayon manufacture.

Work on rubber includes a study of the degradation of the rubber molecule under the influence of heat and other radiations. In this connection, Biswas referred to our pending grant with Dr. Sukh Dev on the heat treatment of tung oil, and speculated on a parallel study of tung oil end products produced by nuclear radiations.

Biswas has an interest in organic semiconductors produced by polymerization in the presence of nuclear radiation. Within the next year, if he gets the equipment he needs, he will expect to begin work in this field.

In about six months the Division expects to undertake a comprehensive physical chemical investigation of natural silk, including X-ray and electron diffraction studies. It is in a position to do similar work on wool.

A minor interest concerns the possibility of obtaining useful long-chain compounds from wool grease.

I have a list of the Division's publications during the period 1955 to 1960. It includes 104 papers and 8 patents.

Polymer Chemistry Division

Dr. S. L. Kapur, Assistant Director in Charge

Much fundamental work is conducted in this Division, although it is the applied studies that are most in evidence. The principal fields of interest are rubber, plastics, ion-exchange and other resins, and surface coatings.

Investigations on rubber are largely of a short-term, applied nature, concerning, for example, formulation of synthetic rubbers having thermal conductivity and chemical resistance; preparation of rubber-base adhesives; compounding of high-impact ebonite; development of curing accelerators from native products; and development of flameproof rubber and microcellular rubber. One recently-completed project involved depolymerizing rubber to liquid form, casting it, and vulcanizing back to the polymeric form.

India has not been an important consumer of rubber, as illustrated by the following per capita consumption figures for 1955: U.S.A., 20.7 lb., world, 2.6 lb.; world except U.S.A., 1.4 lb.; India, 0.2 lb. Currently, domestic production of rubber is about 25,000 tons annually, while imports range from 10,000 to 15,000 tons. Demand is now increasing faster than production; and it is estimated that in the period 1955-65, consumption will have increased by 60-fold.

Cashewnut shell liquid (CNSL) has been extensively studied in the Division. This is a black oil obtained from cashewnut shells after the roasting process; it is bought by several U.S. firms for use in brake linings, acid-resistant paints, etc. The oil is shipped under strict specifications; it polymerizes readily, and deteriorates in quality if it was overheated in roasting. The Division has worked out a process for preparing a cation-exchange resin from off-grade CNSL that is not acceptable for export, by polymerization of the liquid and subsequent sulfonation. NCL has patented the process and sold its rights to a private firm, which is making and selling the resin for water-softening purposes.

Another cation-exchange resin has been made by polymerizing styrene in small, uniform spheres, with divinylbenzene as the cross-linking agent.

Styrene polymers are the basis also for regid foam plastics, that are currently under study. Also, both rigid and flexible foams are being made from polyurethanes, with and without the incorporation of castor oil.

Tobacco seed oil is being studied as a basis for alkyd resins to be used in wrinkle finishes.

Modified urea resins have been developed for coating wood textile bobbins; these are claimed to withstand steam and hot water during textile processing.

Coconut husks are being used with a binder to form very satisfactory-appearing cushion and packing materials.

Considerable attention has been given to development of water-purification filters for tube wells, incorporating alternate layers of sand and resin. Dr. Kapur advised that such a tube filter, of 10-inch diameter, had been in commercial use in New Delhi over the past year, replacing a gravel filter of 22-foot diameter.

The Division's shop is well equipped with injection and compression molding machines, Banbury mixer, large hydraulic press, etc.; some of this equipment was received under the Colombo Plan, and some from TCM. The plastics testing room (constant temperature and humidity) also is well equipped; I noted a French tensile tester, a Scott tensile tester, and a Dillon dynamometer.

I was shown a list of seven processes recently released to industry by the Polymer Chemistry Division. These included several of the developments previously mentioned, plus pressure-sensitive adhesive tapes, a can sealing composition, and a foundry core oil. Apparently NCL receives royalties on some of the developments, and not on others. The matter of whether research workers should share in the royalties appears to be an unsettled question.

Dr. Kapur spent three years as a student of Herman E. Mark at the Polytechnic Institute of Brooklyn. Although his discussion with me was largely concerned with applied research, he appears to be fully competent in all phases of polymer chemistry.

I have a list of the 57 papers published by the Division in the period 1955-59.

Chemical Engineering Division

Dr. M. U. Pai, Assistant Director in Charge

The work of this Division falls into two categories. One involves the conventional scaling-up of processes developed by other divisions of NCL. Examples include a diastase process developed by the Biochemistry Division, which has been commercialized and sold to a private firm; catalytic reduction of glucose to sorbitol; chemical oxidation of sorbitol to sorbose; and fermentative production of vitamin B_6. Also, they are collaborating with the Organic Chemistry Division in the thermal cracking of castor oil to produce heptaldehyde and undecylenic acid, and alkaline cracking to produce sebacic acid and 2-octanol.

Dr. Pai's major interest is in the other aspect of the Division's work, which involves process kinetics. His early P.L. 480 proposal on continuous hydrogenation and hydrogenolysis of fats, previously mentioned, fell into this category. The same is true of his current proposal A7-FS-9, on continuous pulping of tropical cellulosic raw materials for producing dissolving grade pulps.

Dr. G. M. Vyas, who would be the principal investigator for the latter work, explained that one objective would be to reduce the volume of liquors needed for soaking the bulky raw materials (bagasse, bamboo, hardwoods), by application of continuous procedures.

The Division is working on four or five projects concerned with alcohol. Dr. Pai noted in passing that Firestone is erecting a factory in India to produce synthetic rubber from alcohol by way of ethylene.

As indicated in Dr. Saeman's report, the Division has an impressive array of engineering process equipment. Among the smaller apparatus, I noted a British-made electron microscope, about 10 years old, and two electron diffraction apparatuses, made in India.

Essential Oils Division

Dr. S. C. Bhattacharyya, Assistant Director in Charge

I met Dr. Bhattacharyya, although I had no opportunity to review his program. His Division constitutes one of four major Indian research centers for work on essential oils, the others being located at the Indian Institute of Science, Bangalore; the Forest Research Laboratory, Bangalore; and the Harcourt Butler Technological Institute, Kanpur. With some 30 to 35 chemists in the Division, Bhattacharyya appears to have developed a very active program concerned with both essential oils and synthetic perfumery materials.

Inorganic Chemistry Division

Dr. J. Gupta, Assistant Director in Charge

I did not visit this Division. However, I note from a recent report that it is considerably interested in the separation of rare earths, particularly from commercial residues accumulated in processing monazite for uranium and throium; synthetic cryolite from Indian fluorspar; phosphatic compounds for detergent formulations; fusel oil esters for waterproofing cotton, leather, and paper; and preparation of rare inorganic chemicals.

Library

The library subscribes to 725 scientific journals. Other facilities were reported to be adequate.

Attachment 2

Poona Club, Poona
Friday night, November 18, 1960

TO: Henry W. Marston

FROM: S. B. Detwiler, Jr.

SUBJECT: Progress Report and Advice of Action

Today, at the National Chemical Laboratory, Mr. DeMoss and I successfully negotiated our fourth grant--UR-A7-(40)-12, on the heat treatment of tung oil. I was pleased at the result, inasmuch as our project--in the field of organic chemistry--represented a complete departure from the institution's original proposal, a chemical engineering study on a different subject. They accepted our plan of work in toto, after an hour or two of study. The principal investigator will be Dr. Sukh-Dev, NCL's assistant director for organic chemistry, about whose competence there is no question.

In a morning conference with Director Venkataraman, the deputy director, and the five assistant directors, Dr. Venkataraman asked about the status of another proposal that NCL had submitted, entitled "Chemical investigations of the wood extractives of the various species of Dahlbergia Linn., fam. Leguminosae." This happens to be one of several subjects in which he has a particularly keen personal interest. He has worked in this field for a number of years, and brought the work along with him from his previous post at the University of Bombay. Here at NCL it is one of the studies that he keeps under his personal supervision, without delegation to the assistant directors.

The story on this one is that FRTPD sent it to Utilization Research. We numbered it UR-A7-(00)-d, then dropped it upon evaluation, primarily for its lack of commodity interest. We advised FRTPD of this action; but it occurred to me this morning that we had neglected to remind you that the Forest Products Laboratory also might very properly consider the proposal.

I am sending a copy of this memo to Mr. Freeman in Washington, as an indication that he should check with Mrs. Cook as to whether the proposal was referred to FPL. If not, they should bring it to the attention of Mr. Lexen for advice and appropriate action. They should keep in mind that Dr. Venkataraman's interests are not confined to Dahlbergia spp; he would quite probably be willing to work on any woods that FPL suggested as being of mutual interest to the two countries.

The proposal was sent to Washington in November, 1959. Prompt action along the foregoing lines would be desirable from the standpoint of good relations with NCL.

Cc- A. F. Freeman

Attachment 3

March 7, 1961

Dr. K. Venkataraman, Director
National Chemical Laboratory
Poona, India

Dear Dr. Venkataraman:

I want to thank you for the many courtesies extended to Mr. DeMoss and me during our visit to the National Chemical Laboratory on November 18 and 19, 1960. I am sorry that the pressure of daily duties in Washington has prevented my making an earlier response.

I should like also to comment on the status of our grant negotiations and several other matters that have arisen in consequence of our visit.

(1) Technical and fiscal aspects of project UR-A7-(40)-12, "Investigation of the effect of heat on tung oil and derivatives of tung oil, and the characterization and identification of compounds resulting from heat treatments, to extend the utilization of tung oil," were negotiated with Dr. Sukh Dev, assistant director in charge of the Organic Chemistry Division. Dr. Sukh Dev had no changes to suggest in the language of our plan of work; and he agreed to prepare a proposal corresponding to the project, which would be forwarded for clearance to Secretary of Agriculture K. R. Damle's Committee in New Delhi.

If the proposal has already gone forward to New Delhi, we should much appreciate receiving an information copy for our records; it may be addressed to our new office in New Delhi, as indicated below. Or if transmission of the proposal is likely to be delayed, we should find it helpful to be so advised.

(2) I left with Dr. Sukh Dev two "Research Problems" that we had developed, namely UR-RP-S-(21)-4, on aziridinyl phosphorus compounds, and UR-RP-S-(21)-5, on positions occupied on the glucose units by substituents of chemically-modified cottons. In his letter of December 6 addressed to me in New Delhi, Dr. Sukh Dev expresses the view that he ought not to undertake these Problems because of limited space facilities at the present time. We are content with this decision, and shall consider placing them elsewhere. As Dr. Sukh Dev says, the projected tung oil work will doubtless lead to other lines of research, of mutual interest to us and the Organic Chemistry Division.

(3) In his letter of December 1 to me at New Delhi, Dr. A. B. Biswas of the Physical Chemistry Division discusses several program matters, of which the first concerns our "Research Problem" UR-RP-S-(21)-6, "X-ray study of crystallite orientation and spiral angle in native and chemically modified cottons," etc., that I had left with him for examination. On Dr. Biswas' advice, I discussed this Problem also on November 26 with Dr.G.N. Ramachandran, head of the Physics Department at Madras University. Dr. Ramachandran

was unwilling to undertake the Problem himself; but he volunteered to bring it to the attention of Dr. Radakrishnan in the laboratories of the Ahmedabad Textile Industry Research Association, Ahmedabad. To date we have heard nothing further from either Dr. Ramachandran or Dr. Radakrishnan.

It would appear that Dr. Biswas is free to reconsider the foregoing Problem, if he cares to do so. However, I judge that he is more interested in the topics discussed in the next section.

(4) Dr. Biswas expresses interest in five other aspects of cellulose research, as follows: (a) Solution properties of cellulose (cottons) including chemically modified cellulose; (b) Studies on the crystalline-amorphous ratio and their control during regeneration of cellulose from solutions; (c) The crystallite size and distribution in the fibre matrix; (d) Surface area and reactivity of cellulose; and (e) Molecular weight distribution, etc.

We should be interested in receiving for evaluation, detailed proposals for any or all of the last three aspects, (c), (d), and (e). We should not be interested in aspect (a) because of possible conflicts with projected work at another institution, or in aspect (b) because it appears to concern man-made fibers rather than cotton.

(5) Dr. Biswas also expresses interest in our "Research Problem" UR-RP-N-(10)-2, "Rheological studies on modified cereal starches by investigating the changes in flow characteristics during the paste preparations, and at high shear rates after pasting," etc.; and he mentions four aspects of this Problem that he is prepared to undertake. It is suggested that Dr. Biswas prepare and send us a complete research proposal, outlining the plan of work in some detail.

(6) Finally, Dr. Biswas refers to our discussion of new compounds for suppression of water evaporation loss in reservoirs; he outlines his interests under the following aspects: (a) Synthesis of tailor-made compounds keeping in view their stereochemical and film forming properties and screening of them for water evaporation resistance; (b) Fundamental studies on the physico-chemical properties with particular reference to the film forming properties and the nature of the monolayers formed by the potential compounds; (c) Field trials in lakes and reservoirs.

The first two of these aspects are of definite interest to our Utilization Research group, insofar as concerns their potentialities for utilization of cottonseed and other common vegetable oils. In this instance, it will not be necessary for Dr. Biswas to prepare a research proposal, since I believe that my notes and the reprint that he gave me (Nature 187, 870 (1960)) contain sufficient information on his ideas. Instead, we shall undertake to prepare a project which will be brought to your attention, through channels, in due course. The project will be assigned the number UR-A7-(40,60)-28.

The third aspect, concerning field trials of compounds that you have already produced, will be brought to the attention of our experts in soil and water conservation research.

(7) I have just received Dr. Biswas' letter of February 27, in which he wonders whether I received his letter of December 1. He will know by the foregoing that I did indeed receive the letter, and have given it very serious consideration.

(8) Dr. Biswas sent me a list of publications of the Physical Chemistry Division for 1955-60. We should be glad to have any other publication lists that may be available from other divisions, as well as any recent "Research Programme" statements and annual reports. Also, I understood from Dr. Jaganathan that an all-India catalogue of culture microorganisms was about to be published; if this is now available, we should be glad to have a copy.

A Far Eastern Regional Research Office has now been established in New Delhi to aid in the conduct of our Public Law 480 grants program. Further advice from us on developments in the matters discussed above will be sent to you through Dr. Paul W. Oman, director of the Office. Communications from you may be addressed to Dr. Oman in care of the Agricultural Attache, American Embassy, New Delhi.

I recall that you expected to spend four months at Purdue University in 1961, as a visiting professor. If your schedule should permit a visit to Washington, I am sure that a number of our research administrators would be glad to meet with you, to discuss developments in our projected programs and to return some of the courtesies that you have accorded to our representatives when they visited Poona. Among these persons are Dr. G.E. Hilbert and Mr. H. W. Marston of the Foreign Research and Technical Programs Division, whom I believe you already know, and my supervisor, Dr. G. W. Irving, Jr., who is Deputy Administrator of Agricultural Research.

Sincerely,

Samuel B. Detwiler, Jr.
Physical Science Administrator

Attachment

cc-Dr. Hilbert
Dr. Irving
Mr. Marston
Dr. Oman, New Delhi, India
FAS-2
Horace J. Davis, Agri. Attache, New Delhi
Administrator, Food and Agriculture - 3

ARS:OA
SBDetwiler,Jr./jrg
3/7/61

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D. C.

March 4, 1961

TO: Guido E. Hilbert, Director, Foreign Research and Technical Programs Division

FROM: Samuel B. Detwiler, Jr., Special Assistant to the Administrator

SUBJECT: Foreign Travel, 1960 - Report No. 5
India: Indian Institute of Science, Bangalore (November 21)

Mr. E. R. DeMoss and I visited the Indian Institute of Science, Bangalore, on November 21, 1960. We held discussions with the following persons, among others:

Central Staff

S. Bhagavantam, D.Sc., Director of Institute
A. G. Pai, M.A. (Camb. and Agra), Registrar
S. S. Prabhu, B.A., Assistant Registrar
T. S. Krishnaiengar, B.Sc., Liaison Officer

Department of Biochemistry

P. S. Sarma, Ph.D. (Wisconsin), Professor of Biochemistry and Head of Department
P. L. Narasimha Rao, Ph.D. (Bombay), Lecturer
B. R. Das, M.Sc. (Bombay), Research Assistant
A. N. Radhakrishnan, Ph.D., Fellow

Department of Organic Chemistry

D. K. Banerjee, D.Sc. (Calcutta), Professor of Organic Chemistry and Head of Department
B. H. Iyer, Ph.D. (Bombay), Assistant Professor
M. V. Bhatt, Ph.D. (Bombay), Lecturer

Department of Inorganic and Physical Chemistry

M. R. Aswatha Narayana Rao, D.Sc. (Madras), Professor of Physical Chemistry and Head of Department

Fermentation Technology Laboratory

J. V. Bhat, Ph.D., D.Sc. (Bombay), Assistant Professor and Head of Laboratory

Grant Negotiations

Principal purpose of this visit was the negotiation of a grant based on the Approval Copy of the following project:

UR-A7-(10)-7
Fundamental studies of enzyme systems isolated from Pseudomonas, to obtain information on the conversion of carbohydrates derived from cereal grains to organic acids having potential industrial value.
Principal investigator: J. V. Bhat

This project was the outgrowth of a proposal submitted by the Institute in early 1959, entitled, "Salicylate as intermediate in the breakdown of aromatic ring by Pseudomonas." The proposal was reworked by UR&D into a project that was made ready for negotiation by the Asia team of 1959. Sam R. Hoover discussed the project with Dr. Bhat on November 18-19, 1959 (see page 11 of his trip report); however, Dr. Bhat was unwilling to undertake the work until he had perfected a method for rupturing Pseudomonas cells to obtain cell-free enzyme preparations.

Subsequently, in 1960, the project was modified by UR&D to provide for studies of methods for obtaining cell-free preparations, as a part of the plan of work. The present Approval Copy was the result.

Discussions of the project were conducted by Mr. DeMoss and myself with Dr. Bhat and Mr. S. S. Prabhu, Assistant Registrar. Dr. Bhat expressed himself as entirely satisfied with the language of the plan of work as we had modified it. However, he indicated that he was not currently aware of a species of Pseudomonas that would produce appreciable quantities of alpha-ketoglutaric acid, although such information is prerequisite to work on the project.

Negotiations were therefore carried out on a tentative basis. It was agreed that Dr. Bhat would screen his collection of Pseudomonas to find a suitable producer of alpha-ketoglutaric acid; and that if he were successful, he would go forward with preparation and submission of a revised proposal, in accordance with terms of the negotiations.

Since returning to Washington, I have discussed this matter with the Northern Utilization Research and Development Division, which advises that it does have some good producers of alpha-ketoglutaric acid in its Culture Collection of Pseudomonas species. Arrangements are being made for the shipment of several lyophilized cultures to the Indian Institute of Science, in order to help Dr. Bhat with his present difficulty and expedite preparation of the revised proposal.

To avoid misunderstandings when he decides to prepare a revised proposal, Dr. Bhat was provided with a skeleton proposal in which critical paragraphs had been filled in to correspond with agreements reached during the grant discussions.

It was made clear to Dr. Bhat and others at the Institute that grant negotiations were subject to clearance by the Damle Committee at New Delhi.

Although Dr. Bhat, as head of the Fermentation Technology Laboratory,

reports direct to Dr. Bhagavantam, he has only a small staff, which I understood to comprise two research assistants. His laboratory facilities are accordingly not extensive, but appear adequate for our projected program. One special item of equipment that he will need is a refrigerated centrifuge.

Dr. Bhat is a modest person who is not inclined to advertise his own qualifications; however, he did advise me that for a reference, we might wish to consult with "Barker at California." I infer that he was speaking of Dr. H. A. Barker, Professor of Microbiological Biochemistry, at Berkeley; Dr. Bhat spent two years at Berkeley as a research associate, in 1945-47.

I feel that Dr. Bhat's hesitancy in accepting our project outright is to his credit, and is characteristic of a meticulous scientist who is anxious to do a careful job of research. He was described by Dr. Sailer as "an extraordinarily earnest person," and by Dr. Hoover as a "dedicated worker." I concur in these opinions.

Together with copies of this report, Dr. Oman in New Delhi is being provided with a setup including copies of project UR-A7-(10)-7, the original proposal, and pertinent background correspondence. A similar setup is being provided for UR-A7-(60)-16 (discussed below).

Status and Indicated Action. - Reports of fiscal and technical negotiation are in preparation by Mr. DeMoss and myself, respectively. Steps are being taken to facilitate Dr. Bhat's search for a suitable Pseudomonas organism. No further action on our part is indicated until Dr. Bhat decides to submit a revised proposal.

Discussion of Projected Protein Research

Most of our time at the Institute was spent in the company of Dr. P. S. Sarma, Head of the Biochemistry Department, who conducted us over his own laboratories, arranged appointments for us in other departments, and accompanied us to visit other staff members.

First topic of discussion with Dr. Sarma was his proposal UR-A7-(60)-16, "Studies on the chemical structure of proteins," which as received by us in August 1960 had four aspects, concerned with milk proteins, thyroid proteins, pulse proteins, and haemoproteins. I advised him that Utilization Research & Development was going forward with preparation of a research project that would be limited to milk proteins; he acquiesced in this action.

I also discussed with Dr. Sarma our Research Problem UR-RP-N-(14)-10, "Investigations on the quantitative separation of grain sorghum proteins into pure homogenous protein components. . ." He indicated his willingness to undertake these studies also; and it was agreed that we would prepare a research project, which after clearance would be brought to his attention. (The research project is now going forward; it has been assigned the number UR-A7-(10)-25.)

Dr. Sarma also expressed willingness to undertake similar studies on the proteins of eggs, and it was agreed that we would undertake the preparation of a project. (It will be assigned the number UR-A7-(60)-27.)

From a commodity standpoint, Dr. Sarma's major interest in protein research involves the Indian pulses. At the time of our meeting I was unwilling to discuss the possibility of a grant in this field, in view of our commitment to negotiate a grant for project UR-A7-(00)-1 (k) (screening of legume proteins) with Dr. A. Sreenivasan at the Central Food Technological Research Institute in Mysore. Subsequently, the grant at CFTRI failed to go forward (see my Report No. 6, in preparation, as well as Report No. 1, Attachment 2). Accordingly, it would appear proper to reconsider our position with Dr. Sarma, and perhaps offer him some aspect of the work outlined in A7-1. The matter will be discussed at the next meeting of the Utilization Review Panel, and subsequently with Dr. Irving.

Discussion of Research Problems

Dr. D. K. Banerjee, head of the Department of Organic Chemistry, expressed tentative interest in a Research Problem that I had brought with me, entitled, "Halocarbination of unsaturated cottonseed fatty materials" (UR-RP-S-(41)-2). Subsequently, in a letter to me at New Delhi, he expressed willingness to undertake the work. Accordingly, the Utilization Review Panel is being asked to expand the Problem into a research project which in due course will be brought to the Institute's attention, through channels, for further consideration. The project will be assigned the number UR-A7-(40)-26.

I left with Dr. M. R. A. Narayana Rao, head of the Department of Inorganic and Physical Chemistry, a Research Problem entitled, "The synthesis and properties of new aziridinyl phosphorus compounds for use in the preparation of new products to increase the utilization of cotton" (UR-RP-S-(21)-4). Up to the present we have had no word of Dr. Rao's decision on the problem; however, I am calling attention to the matter in an acknowledgment letter that currently is being sent to Dr. Bhagavantam.

I discussed two other Research Problems with Director Bhagavantam, but elicited no interest. For the record, these were UR-RP-S-(21)-3, on new solvents for molecular weight determination of cellulose, and UR-RP-S-(21)-5, on the positions occupied on the glucose units by substituents of chemically modified cottons. The first of these will probably be placed at the University of Bombay (see Report No. 2).

Other Suggested Research

Dr. Banerjee, together with his associates Dr. B. H. Iyer and Dr. M. V. Bhatt, brought to my attention a suggestion for research involving "conversion of fatty acids, both saturated and unsaturated, to dicarboxylic acids with carboxyl groups at the ends of the chain." This suggestion involves modification of long-chain fatty acids by treatment with B_2H_6 and other reactants to produce dicarboxylic acids having the same number of carbon atoms, or one or two fewer carbon atoms. The products would have the same general uses as sebacic acid. The idea appears to have been developed by Dr. Bhatt, who impresses me as a particularly capable young researcher, as an outgrowth of his work last year in the laboratories of Professor Herbert C. Brown at Purdue University.

A sketch of the reactions involved was later sent to me by Dr. Banerjee. It has considerable interest on preliminary examination, and will be fur-

ther considered at the March meeting of the Utilization Review Panel. In the absence of unforeseen difficulties, it is possible that the Panel can develop a project without having to go back to the Institute for a detailed proposal. The suggestion has been given the project number UR-A7-(40)-24.

I understood that the Institute intends to pursue this line of work whether or not it receives a grant from us.

The Silkworm Proposal

At some institutions, I noted that one particular P.L. 480 proposal had made the greatest impact on the director's mind. At the Indian Institute of Science, it was the silkworm proposal that held the center of attention.

At the outset of our visit with Director Bhagavantam, he expressed himself quite plainly to the effect that considering the number of visitors who had come to discuss the P.L. 480 program, the tangible results were vanishingly few. He proceeded to ask about the status of his silkworm nutrition proposal, of which, at the time, I was wholly unaware.

(Later I learned that this was proposal A7-ENT-6, "Nutritional studies on the silkworm Bombyx mori, L. - its requirements of vitamins and amino acids. . .," for which the principal investigator was the same Dr. J. V. Bhat with whom I conducted negotiations on UR-A7-(10)-7. The proposal had been submitted by the Institute in early 1959; subsequently, in August 1959, a revised proposal was submitted at the request of FRTPD. Pursuant to Dr. Sailer's visit to the Institute on October 22, 1959, new cost estimates were submitted at the end of the year.)

After I had replied quite plainly that I had come to produce some tangible results in the field of utilization research, and had explained what was meant by the term, Dr. Bhagavantam relaxed his manner, became quite cordial, and acquiesced in our grant negotiations and other discussions, as reported above. The next day, November 22, I happened to meet Mr. Marston in Bangalore, and reported the matter to him for appropriate action.

In the interests of good relations with the Institute, it is recommended that the grant proceedings on the silkworm proposal be brought to a satisfactory conclusion as soon as possible. If the proposal is resting with the Damle Committee, the Institute should be apprised of the fact. As far as I could judge from my visit, there is an indefinite ceiling on the amount of good utilization research that can be placed at the Institute; and I should be disappointed to see these prospects placed in jeopardy.

Another suggestion arising out of this experience is that any future negotiator who visits a foreign institution should have at least a superficial knowledge of the status of all proposals emanating from that institution, whether or not they are in his own particular field.

Attachment 1 - Notes on the Indian Institute of Science
Attachment 2 - Acknowledgment Letter, Detwiler to Bhagavantam

Attachment 1

NOTES ON THE INDIAN INSTITUTE OF SCIENCE

(The Institute has been visited also by the following USDA representatives: Reece I. Sailer on October 22, 1959 (page 40 of trip report); John H. Martin on October 22, 1959 (page 15 of report); Sam R. Hoover on November 18-19, 1959 (pages 10-11 of report); and Richard Wiebe on March 15, 1957 (page 5 of report). Presumably visits have been made by Dr. Hilbert and Mr. Marston, although the record is not at hand.)

General

The Indian Institute of Science was founded by Government action in 1909, in consequence of a large endowment provided by Jamsetji N. Tata, a Bombay business magnate; this action, which is said to have marked the starting point of organized scientific research in India, was the culmination of plans that had been maturing since 1898. The underlying motive for the bequest was Tata's belief "that what advanced a nation or community was not so much the propping up of its weakest and most helpless members, as the lifting up of the best and most gifted so as to make them be of the greatest service to the country."

Actual organization of the Institute was a joint operation by the founder's two sons, the Government of India, and the Government of the Maharaja of Mysore. Both governments contributed substantially to the venture.

The principal objective of the Institute is "to provide for advanced instruction and conduct original investigations in all branches of knowledge and in particular in such branches of knowledge as are likely to promote the material and industrial welfare of India."

The Institute has had seven distinguished directors, of whom the first was Dr. Morris W. Travers, who was appointed to the post in 1906, at the age of 34, on advice of the Royal Society; he had previously occupied the Chair of Chemistry at Bristol University. Fourth director was Sir Chandrasekhara V. Raman (1933-37), of Raman spectra fame; the sixth was Professor M. S. Thacker (1949-55), currently Director General of the Council of Scientific and Industrial Research. The present director (1957-) is Dr. S. Bhagavantam.

The principal authority of the Institute is its Visitor, who is ex officio the President of India.

Until about 1950, a major part of the income of the Institute was derived from the founder's endowment, augmented by contributions from the Governments of India and Mysore. Today, perhaps half the income is contributed by the Indian Government. Income for 1959 amounted to Rs 8,350,000 (about $1.8 million). (Considering differences in the cost of living and the standard of living, I should expect a comparable American research organization to have a budget of at least $10 million.)

Indian Government contributions are channelled through such agencies as the Council of Scientific and Industrial Research, the Ministry of Education, the Indian Council of Medical Research, the Indian Oilseeds Com-

mittee, and the Department of Atomic Energy.

The Institute is organized into two faculties--Science and Engineering--containing the following departments and laboratories:

Faculty of Science

Department of Inorganic and Physical Chemistry (Professor M. R. Aswatha Narayana Rao)
Department of Organic Chemistry (Professor D. K. Banerjee)
Department of Biochemistry (Professor P. S. Sarma)
Department of Physics (Professor R. S. Krishnan)
Pharmacology Laboratory (Asst. Professor M. Sirsi)
Fermentation Technology Laboratory (Asst. Professor J. V. Bhat)
Department of Applied Mathematics (Professor P. L. Bhatnagar)
Director's Research Laboratory (Dr. M. Krishnamurthi, Lecturer)

Faculty of Engineering

Department of Aeronautical Engineering (Professor Satish Dhawan)
Department of Internal Combustion Engineering (Professor M. R. Krishnamurthy Rao)
Department of Metallurgy (Professor A. A. Krishnan)
Department of Power Engineering (head professorship vacant)
Department of Electrical Communication Engineering (Professor S. V. C. Aiya)
Department of Chemical Technology and Chemical Engineering (Professor N. R. Kuloor)
Section of Economics and Social Sciences and Section of Industrial Engineering and Administration (Professor R. Natarajan)
Modern European Languages (Mrs. H. Kale, Lecturer)

Of the foregoing departments, Biochemistry, Organic, and Inorganic and Physical Chemistry, in that order, appear most likely to contribute to the P.L. 480 104(a) program. I was able to inspect the first of these, and to visit particular individuals in the other two, as well as in the Fermentation Technology Laboratory.

Apparently the Institute has always accepted students on one basis or another. However, about a year ago its academic status was emphasized when it was recognized as a university for the purpose of granting degrees. Both the Science and Engineering faculties may confer the M.Sc., Ph.D., and D.Sc. degrees by research; additionally, the Engineering Faculty may confer the B.E. and M.E. degrees by examination.

Through March, 1960, the Institute had awarded 2 Ph.D. degrees, 10 M.Sc. degrees, 71 M.E. degrees, 21 M.E. degrees with distinction, and 1 B.E. degree with distinction.

In 1959 there were 526 full-time students and 154 part-time students. The staff numbered about 200 persons.

Some of the Institute's work is published in its own Journal of the Indian Institute of Science, a quarterly that in 1961 was in its 43rd volume. Use is made also of the standard European and American outlets, such as

(for biochemistry) Science, Nature, Journal of Biological Chemistry, and Biochemical Journal.

The Institute occupies 372 acres at the north end of Bangalore, an original gift of the Government of Mysore. Scientific and facilitating activities are housed in about two dozen buildings, and accomodations are provided for at least part of the staff. These, together with student quarters, a primary school, nursery, gymkhana, dispensary, post office, etc., constitute an impressive physical plant.

The Director's Research Laboratory typifies a goal that is often cherished but rarely realized by American research administrators. At other Indian institutions also--notably the National Chemical Laboratory in Poona and the Central Leather Research Institute in Madras--I found that the director had provided for close contact with his immediate research interests.

Department of Biochemistry

The equipment and other physical facilities of the Department appeared adequate but not particularly eye-catching; my attention was attracted rather to the research workers and their interests. Dr. Sarma has about a dozen staff members and a few vacancies; also, he has 35 students with master's degrees, who are currently working on Ph.D. degrees. Below are given brief notes on the principal interests of different staff members.

Homi R. Cama, Ph.D., D.Sc. (Liverpool), Assistant Professor of Biochemistry. Was in the United States at the time of my visit. Has varied research interests, including riboflavin coenzyme nucleotides, anhydrovitamin A_2 and its derivatives, and the nutritive value of various proteins. Among recent accomplishments in these fields, occurrence of the flavin mononucleotide and flavin adenine dinucleotide hydrolyzing enzymes in plants was demonstrated for the first time. Nutritional data on peanuts and sesame, and on the proteins of grams, fish meal, and human milk, have been correlated with electrophoretic studies of the protein fractions and their amino acid composition. The biological activity of anhydrovitamin A_2 has been studied.

M. K. Subramaniam, D.Sc. (Madras), Assistant Professor of Biochemistry. Is the Department's specialist in cytogenetics; has shown that the yeast nucleus has no relation to the vacuole.

P. L. Narasimha Rao, Ph.D. (Bombay), Lecturer. (1) Is primarily interested in antibiotics from Indian plants and soils; for example, he has recently published on the formation of antifungal antibiotics by Streptomyces champavati n.sp. (2) Another aspect of this field concerns the production of penicillin at relatively high temperatures, in view of a prevalent lack of cold water in India for commercial operations. He has found a strain of Malbranchea pulchella that will produce penicillin at 42°C., and is working to improve yields, which are not yet good. (3) Dr. Rao is also interested in essential amino acid patterns in human milk. (4) With other staff members, he is working on haemoglobin from the red blood cells of buffalo blood; he has found three types of haemoglobin, each with different terminal groups and amino acid composition.

S. C. Pillai, Ph.D. (Madras), Lecturer. Is the Department's specialist on sanitation biochemistry. He has carried out recent studies on the

extent of removal of fatty constituents during treatment of sewage, nitrogen changes during dilution of sewage, and the significance of protozoan activity on fish life in polluted waters.

J. Ganguly, Ph.D. (Reading), Lecturer. Is concerned chiefly with vitamins, including vitamin A absorption in the intestines, the role of enzymes, how vitamin A combines with fatty acids, etc.; also is interested in cholesterol esterification. He has recently shown that transport of vitamin A during absorption occurs either in the free state or bound with esters of only higher fatty acids.

R. K. Maller, Ph.D. (Madras), Lecturer. Is chiefly interested in applications of radiobiochemistry to studies of nucleic acids. He has studied at Wisconsin.

C. S. Vaidyanathan, Ph.D. (Madras), Lecturer. Is the Department's specialist on plant biochemistry, with particular interest in such subjects as indole and auxin metabolism, and plant tumors. It was recently shown that a powerful indole-destroying enzyme is present in Amaranthus.

K. Sivarama Sastry, Ph.D. (Madras), Technical Assistant. Specializes in radioisotope studies of trace elements in microorganisms.

S. Natarajan, B.Sc. (Madras), Research Assistant. Has worked in several fields, including the nutritive value of oilseed proteins and buffalo haemoglobins.

B. R. Das, M.Sc. (Bombay), Research Assistant. Specializes in the agar electrophoresis technique for separation of carbohydrates and proteins, and has published on the subject with K. V. Giri, who developed the technique. (See, for example, J. Ind. Inst. Sci. 41, 67-73 (1959), on serum proteins, and 41, 74-79 (1959), on lipoproteins.) (Professor Giri, who preceded Sarma as head of the Department, died July 17, 1958.)

The Institute recently received a Rockefeller Foundation grant of some $28,000, of which the Department of Biochemistry will get the major share. Accordingly, two fellows--L. K. Ramachandran and A. N. Radhakrishnan--have been appointed. Ramachandran, who has studied at Berkeley with Fraenkel-Conrat and W. M. Stanley, was in Madras at the time of my visit, but expected soon to report to Bangalore; he will conduct fundamental studies on proteins and amino acids. Dr. Radhakrishnan, who was already on the job, is interested in hydroxyproline; his work may have a tie-in with the structure of collagen. He also has had training in the States.

The Institute makes much use of fellows in its research programs; the term is a ready index of a man's qualifications. The fellow receives a fixed stipend rather than a graduated salary; he has the advantage that he pays no income tax.

Dr. T. Ramasarma, Scientist's Pool Officer, has studied in the States; he is working on enzymes, particularly coenzyme Q. A Scientist's Pool Officer is a person who has studied in the States, has returned to India with no fixed job, and is put on the staff at the Indian Institute of Science until a permanent assignment is found for him.

The Department published 29 papers during 1958-59. A list of them, and sundry reprints, are at hand and will be made available to the Utilization Review Panel.

Attachment 2

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D. C.

March , 1961*

Dr. S. Bhagavantam, Director
Indian Institute of Science
Bangalore 12, India

Dear Dr. Bhagavantam:

I want to thank you for the many courtesies extended to Mr. DeMoss and me during our visit to the Institute on November 21, 1960. I am sorry that the pressure of daily duties in Washington has prevented my making an earlier response.

I should like also to comment on the status of our grant negotiations and several other matters that arose during our visit.

(1) Technical and fiscal aspects of project UR-A7-(10)-7, "Fundamental studies of enzyme systems isolated from Pseudomonas, to obtain information on the conversion of carbohydrates derived from cereal grains to organic acids having potential industrial value," were negotiated with Professor J. V. Bhat of the Fermentation Technology Laboratory and Mr. S. S. Prabhu, Assistant Registrar. Dr. Bhat expressed himself as entirely satisfied with the language of the plan of work as we had modified it. However, he indicated that he was not currently aware of a species of Pseudomonas that would produce appreciable quantities of alpha-ketoglutaric acid.

It was agreed that Dr. Bhat would screen his collection of Pseudomonas to find a suitable producer of alpha-ketoglutaric acid; and that if he were successful, he would go forward with preparation and submission of a revised proposal, in accordance with agreements reached during our negotiations.

Since returning to Washington, I have discussed this matter with our Northern Utilization Research and Development Division at Peoria, Illinois. The Northern Division advises that it does have some good producers of alpha-ketoglutaric acid in its collection of Pseudomonas, and will be glad to make them available to Dr. Bhat. We shall ask the Division to ship several lyophilized cultures to you, direct from Peoria, in the near future.

I doubtless advised Dr. Bhat that when the revised proposal leaves the Institute, it should be forwarded for clearance to Secretary of Agriculture K. R. Damle in New Delhi. At the same time, we should be glad to receive an information copy for our records.

*Typed 3/1/61; date to be assigned in New Delhi.

Attached are two reprints of publications on Pseudomonas oxidations (J. Biol. Chem. 186, 743 (1950) and 217, 607 (1955)) that may be of interest to Dr. Bhat.

(2) I discussed with Dr. P. S. Sarma our projected modifications in his proposal UR-A7-(60)-16, "Studies on the chemical structure of proteins," whereby the work would be limited to a study of milk proteins; Dr. Sarma was agreeable to this change. Dr. Sarma also expressed interest in our suggestions for similar studies of the proteins of eggs, and of sorghum. Accordingly, we are in process of preparing projects in these three commodity fields, and shall expect to bring them to your attention in due course.

We shall bear in mind Dr. Sarma's interest in research on pulse proteins. If a suitable segment of this field can be developed that is of mutual interest, and does not conflict with other commitments, we shall expect to be in further touch with you.

(3) I discussed with Professor D. K. Banerjee a "Research Problem" that we had prepared under the title, "Halocarbination of unsaturated cottonseed fatty materials." Subsequently, in his letter of December 6 to me at New Delhi, Dr. Banerjee expressed interest in undertaking this work. We shall accordingly expect to expand the "Problem" into a research project under the number, UR-A7-(40)-26. This will be brought to your attention in due course.

(4) Drs. Banerjee, B. H. Iyer, and M. V. Bhatt brought to my attention a suggestion for work on the conversion of long-chain fatty acids to dicarboxylic acids through hydroboration and other mechanisms. The reactions involved were outlined on a sheet attached to Dr. Banerjee's letter of November 22, addressed to me in New Delhi.

On preliminary evaluation, this suggestion appears to have considerable interest and merit; it has been assigned the number UR-A7-(40)-24. We shall expect to discuss it further at a meeting of our Utilization Review Panel on March 13, and to advise you subsequently of its status.

(5) I left with Dr. M. R. A. Narayana Rao a copy of our "Research Problem" UR-RP-S-(21)-4, entitled "The synthesis and properties of new aziridinyl phosphorus compounds for use in the preparation of new products to increase the utilization of cotton." We should be glad to learn whether Dr. Rao is interested in undertaking work on this subject.

A Far Eastern Regional Research Office has now been established in New Delhi to aid in the conduct of our Public Law 480 grants program. Further advice on the status of the proposals discussed above will be sent to you through Dr. Paul W. Oman, director of the Office. Communications from you may be addressed to Dr. Oman in care of the Agricultural Attache, American Embassy, New Delhi.

3-Dr. S. Bhagavantam

I am particularly obliged to Dr. Sarma, Mr. Prabhu, and Mr. T. S. Krishnaiengar for going beyond the call of duty in seeing that my time at the Institute was well spent.

Sincerely,

Samuel B. Detwiler, Jr.
Special Assistant to the Administrator

Attachments - Two Reprints

cc: Dr. Hilbert
Dr. Irving
Mr. Marston
Dr. Oman, New Delhi, India

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D. C.

August 24, 1961

TO: Guido E. Hilbert, Director, Foreign Research and Technical Programs Division

FROM: Samuel B. Detwiler, Jr., Special Assistant to the Administrator

SUBJECT: Foreign Travel, 1960 - Report No. 6
India: Central Food Technological Research Institute, Mysore (November 23-24)

Mr. E. R. DeMoss and I visited the Central Food Technological Research Institute at Mysore on November 23-24, 1960. We held discussions with most of the following persons, who include the principal research staff of the organization:

Dr. V. Subrahmanyan, Director
Dr. A. Sreenivasan, Deputy Director
Dr. M. Srinivasan, Assistant Director in Charge, Biochemistry and Nutrition Division
Maj. N. V. R. Iyengar, Senior Scientific Officer in Charge, Packaging and Containers Division
Dr. M. Swaminathan, Assistant Director in Charge, Dietetics Division
Mr. B. H. Krishna, Assistant Director in Charge, Food Engineering Division
Dr. G. S. Siddappa, Assistant Director in Charge, Fruit Technology Division
Mr. Abdul Rahman, Assistant Director in Charge, Information and Statistics Division
Mr. K. V. Srinath, Senior Scientific Officer, Information and Statistics Division
Dr. N. L. Lahiry, Assistant Director in Charge, Meat and Fish Technology Division
Mr. D. S. Johar, Senior Scientific Officer in Charge, Microbiology and Sanitation Division (did not meet)
Dr. T. N. R. Rao, Acting in Charge, Microbiology and Sanitation Division
Dr. D. S. Bhatia, Assistant Director in Charge, Food Processing Division
Mr. S. K. Majumder, Senior Scientific Officer in Charge, Grain Storage Division
Dr. H. C. Srivastava, Senior Scientific Officer in Charge, Storage and Preservation Division
Mr. H. C. Bhatnagar, Officer on Special Duty, Regional Research Station
Mr. V. S. Govindarajan, Senior Scientific Officer in Charge, Arecanut Technology Division

During an inspection of the laboratories, we also met many of the other scientists on the staff.

Attempted Grant Negotiations

Principal purpose of this visit was the negotiation of grants based upon the Approval Copy of the following projects:

UR-A7-(00-1(k)
Chemical screening of lesser-known legumes of India by investigation of their seed protein content and amino acid composition, to provide information basic to development of new high-protein crops.
Principal investigator: Dr. A. Sreenivasan

UR-A7-(10)-2
Fundamental and applied investigations on supplementation of cereal grains with oilseeds and legumes and their protein concentrates to improve the nutritional value of low-cost food combinations through a better balance of essential amino acids, as a basis for increasing the export of cereal grains.
Principal investigator: Dr. A. Sreenivasan

These projects represented modifications of research proposals that had been submitted by Dr. Sreenivasan in the latter part of 1958, when he was head of the Food Technology Laboratory in the Department of Chemical Technology, University of Bombay. When Dr. Sreenivasan moved to his present post at CFTRI, we had assumed that the two research proposals should be transferred with him. I discussed the matter on November 14-15 with Dr. G. M. Nabar, head of the Department of Chemical Technology at Bombay, and obtained his concurrence in this decision. (See my India Trip Report No. 2, page 2-5.)

When Dr. Sreenivasan visited Washington in September 1960, as a delegate to the Fifth International Congress on Nutrition, I had discussed both projects with him, and received his oral assurance that in each case the plan of work was entirely satisfactory. When I wrote to Dr. Subrahmanyan from New Delhi to arrange for the grant negotiations, he responded with several letters and telegrams of cordial welcome. Upon our arrival in Mysore, he was punctilious in the payment of courtesy calls, and in all respects the perfect host. And at the CFTRI itself, he went to great lengths in arranging for us to inspect the laboratories, review the program, and develop research topics of mutual interest with the various Division heads. Accordingly, I was astonished when it gradually became apparent that Dr. Subrahmanyan had no intention of allowing grant negotiations to proceed for our two projects. I inferred that Dr. Sreenivasan was considerably distressed at this turn of events.

When I brought the matter to a head, Dr. Subrahmanyan handed me a sealed letter dated the same day (November 23), and asked that I read it that evening and comment the following day. This letter and an enclosed supporting statement are quoted in full in Attachment 1. The arguments are diffuse. However, Dr. Subrahmanyan asserts that CFTRI holds an eminent position in the Indian research picture and should be treated with a broad-based and generous approach, with simplification of procedures and elimination of formalities; that it already employs most of the competent Indian scientists in the food technology field, and would find it difficult to employ additional workers on a short-term basis for our "ad hoc" grants; that we ought to make a broad grant of funds to the Council of Scientific and Industrial Research--the parent organization--which would then be re-granted to CFTRI as a supplement to its normal budget, since this arrangement presumably would facilitate the programming of research and the long-term

hiring of scientists; that under this broad grant, sub-projects of mutual interest, corresponding to our research projects, might be set up; that there ought to be a mutual exchange of scientists between CFTRI and USDA; and that some means should be found to provide dollar exchange needed for the purchase of special equipment.

Dr. Subrahmanyan made the further point in conversation that the mere offer of rupees was little inducement to participate in the P.L. 480 program, since he had no trouble in getting needed funds through regular channels. Also, he implied that much of his thinking was based upon his experience with proposals from certain nongovernment U. S. agencies, which failed to materialize partly because of slowness in handling the arrangements, and partly because of the undue amount of supervision that was anticipated.

It is not clear what Dr. Subrahmanyan meant by the statement in his letter, "Drs. Hilbert and Marston who visited us on previous occasions are also well aware of the position. We have in the past submitted several notes."

To add to the obscurity of the situation, on November 24 Dr. Sreenivasan handed me a revised composite statement of cost estimates for our two projects A7-1(k) and A7-2; I understood that these had already been sent forward to the Damle Committee in New Delhi. The preparation of such cost figures on individual projects seems hardly compatible with Dr. Subrahmanyan's proposed new procedures.

After reading Dr. Subrahmanyan's letter, I made no further suggestions to continue the grant discussions. I did make several statements of fact concerning our P. L. 480 operations*, and promised to bring the problem to Dr. Hilbert's attention as soon as feasible. The matter was discussed with Dr. Hilbert in Rome on December 12, and in my summary report of the same date to Messrs. Marston and Oman. (See my India Trip Report No. 1, page 1-8.) Subsequently, I passed the original of the letter to Dr. Hilbert for appropriate action, with copies to Messrs. Irving, Marston, and Oman.

Conclusions. - As concerns food research, CFTRI is more closely allied to the interests of Utilization Research & Development than perhaps any other Indian institution; and the Agricultural Marketing Service also has much in common with this group. Accordingly, it is unfortunate that Dr. Subrahmanyan has developed a block about the acceptance of our "ad hoc" grants, as he calls them, on an individual basis. Part of the trouble is doubtless due to his experience with other American groups engaged in overseas operations, and part to ill-formed conceptions of the practical conduct of our program--conceptions which, by the time of my visit, had become very firmly fixed. For example, he appears to think that to conduct one of our

*For one thing, Dr. Subrahmanyan appeared to think that the agricultural research program was another form of aid to India, and that we were lacking in generosity in its operation. I reminded him that of the proceeds from P.L. 480 sales agreements, a lion's share is indeed generally returned to the country in the form of loans or grants for economic development schemes; that of the generally minor portion of the proceeds reserved for U.S. uses, only a pittance comes to USDA for agricultural research; and that we were obliged to spend this pittance in ways that would benefit American agriculture as well as the other country.

grants he would have to hire hard-to-get personnel, then discharge them on completion of the work; actually, I feel that grant operations generally have involved a transfer of existing personnel (or new personnel hired on a permanent basis) from one line of work to another. His other major problem, concerning the lack of foreign exchange for special equipment, is not singular to CFTRI; all the institutions with which I negotiated grants had to face this problem and work it out with the Damle Committee on a case-by-case basis.

Grant letters are now being written for about eight of the projects that I did negotiate with other institutions in November-December 1960, and the grants should be effective in the near future. Perhaps when Dr. Subrahmanyan has had the opportunity to see these grants in operation, he may be induced, through contacts with CSIR in New Delhi, to reconsider his views. Meanwhile, some form of reply should be made to his letter of November 23, 1960. Meanwhile also, it would serve no useful purpose to send additional USDA technical representatives to Mysore to further attempt the development of a program.

The two research projects A7-1(k) and A7-2 represented modifications of proposals prepared by Dr. Sreenivasan while he was at the University of Bombay. These projects have now been withdrawn by UR&D, on the basis that if relations with CFTRI are ever re-established, it will be better to develop new projects more specifically suited to the interests and facilities of that institution.

Research Proposals and Research Problems

On conclusion of our discussions on grant negotiations, and after I had finished an inspection of the laboratories, Dr. Subrahmanyan called a meeting of his Division heads. At this time, each Division head presented a several-minute resume of his principal fields of interest; and in conclusion, some of them handed me one or more research proposals prepared more or less in the usual P.L. 480 format. It was indicated that some of these were the outgrowth of conversations with Dr. Arthur P. Sidwell of AMS during his visit to CFTRI in May 1960 (see his trip report, page 13); this was the first time that I had heard of Dr. Sidwell's visit. Also, it was indicated that the proposals were prepared by request of Dr. Sreenivasan dated November 7, before the institution was aware of my impending visit.

At the same meeting, various Division heads commented on several Research Problems developed by UR&D, that I had brought with me to the institution and distributed on arrival.

Dr. Subrahmanyan's attitude in this meeting was one of positive expectancy that policy differences would be resolved, and that research collaboration between CFTRI and USDA could and should go forward.

Our Research Problems, and the comments thereon, are listed below. Some of them overlap the research proposals developed by the institution. We can of course take no action to move them forward at CFTRI until Dr. Subrahmanyan's policy questions have been resolved; meanwhile, they may be considered for placement at other institutions.

UR-RP-W-(13)-1
Determination of the importance of lipid constituents of rice to texture and flavor characteristics, thus providing information useful in expanding consumption of U. S. rice domestically and abroad.
Comment: CFTRI is interested; note that this topic is included in a research proposal from the Biochemistry Division, listed below.

UR-RP-W-(61)-7
Basic characterization of the proteins of poultry with regard to those properties of potential importance to texture (tenderness) and juiciness of cooked poultry and hence of importance in consumer demand for and utilization of poultry.
Comment: CFTRI is interested; see also one of the research proposals from the Meat and Fish Technology Division, listed below.

UR-RP-E-(65)-2
A study of salt migration in muscle tissue in order to develop improved curing methods and better cured meat products for use in warm climates.
Comment: CFTRI is interested; although the meat research people have not had much experience in curing methods.

UR-RP-N-(14)-1
Investigations of the composition of nonprotein nitrogen constituents of grain sorghum as a basis for increasing its utilization in feed and food products.
Comment: CFTRI is interested.

UR-RP-N-(42)-4
Investigation of the isoflavones of petroleum ether-extracted soybean meal as a basis for improving the feeding value of soybean oil meal.
Comment: CFTRI is interested.

UR-RP-N-(40)-9
Development of a high-protein food product for India by alcohol-water extraction of fat-free meal from U. S. soybeans.
Comment: CFTRI is interested.

Dr. Subrahmanyan indicated that notes on these Problems would be sent to me at New Delhi, but I did not receive them.

The research proposals received from the Division heads are listed below. All of them have been transmitted to Mrs. Cook of FRTPD. Those that involve utilization research will be given a preliminary evaluation by UR&D. However, no positive action looking forward to the development of grants can be taken until Dr. Subrahmanyan's policy questions have been resolved.

(A) <u>Biochemistry and Nutrition Division</u>

(A1) Studies on quality and chemical characterization of rice varieties.
Duration: 5 years.
Cost estimate: Rs 461,150.

(B) Fruit Technology Division

(B1) Objective methods for determining the degree of maturity of suitable canning varieties of tropical fruits and vegetables.
Duration: 5 years.
Cost estimate: Rs 525,000

(C) Meat and Fish Technology Division

(C1) Composition of muscle proteins of chicken, beef, pork, and mutton at comparable stages of maturity in terms of protein distribution, amino acid composition, and amino acid sequence.
Duration:
Cost estimate:

(C2) Post-rigor changes in muscles (mutton, pork, beef, etc.) during chilling, freezing, and cold storage, and interpretation of these changes in relation to quality of meat.
Duration:
Cost estimate:

(C3) Development of weaning foods based on spray-dried soybean and groundnut milk admixed with skim milk powder, malt extract, etc.
Duration: 2 years.
Cost estimate: Rs 42,296.
Comment: An extension of current work at CFTRI.

(C4) Standards for frozen shrimp, frog legs, and lobster tails for export, and studies on the improvement of the quality of dessicated shrimp.
Duration: 5 years.
Cost estimate: Rs 595,160.
Comment: An extension of current work at CFTRI.

(C5) Distribution of nitrogen and other biochemical differences in red and white meat.
Duration:
Cost estimate:

(D) Microbiology and Sanitation Division

(D1) Manufacture of Cheddar and processed types of cheese with vegetable rennet (milk clotting latex) from *Ficus carica* Linn.
Duration: 3 to 4 years.
Cost estimate: Rs 245,000 (for 3 years).
Comment: Dr. Subrahmanyan commented that another interesting aspect of this field was the self-clotting of vegetable milks. Vegetable rennet research has been under way in India for 25 years.

(E) Food Processing Division

(E1) Technological studies (i.e., processing and utilization) of wheats and pulses.
Duration: 5 years.
Cost estimate: Rs 500,000.

(F) Grain Storage Division

(F1) Control of insects in stored foodstuffs: Microbial control of insects in stored food grains, particularly the Khapra beetle.
Duration: 5 years.
Cost estimate: Apparently Rs 303,000.

(F2) Control of insects in stored foodstuffs: Screening and development of suitable attractants for mobilization, assessment, and control of stored grain pests.
Duration: 3 years.
Cost estimate: Apparently Rs 62,200.

(F3) Control of insects in stored foodstuffs: Development of simple tests and gadgets for estimating brominated fumigants.
Duration:
Cost estimate: Rs 75,000 for special equipment.

(F4) Control of insects in stored foodstuffs: Rapid tests for detecting, and procedure for estimating, pesticide residues on foodstuffs.
Duration: 5 years.
Cost estimate: Apparently Rs 189,000.

(F5) Control of insects in stored foodstuffs: Permissible limits for insecticide residues on foodstuffs.
Duration:
Cost estimate:

Comment: Proposals F3 and F5 would be extensions of going program at CFTRI.

(G) Storage and Preservation Division

(G1) Use of plant growth regulators and skin coatings to facilitate transport, storage, and marketing of some commercial fruits and vegetables (particularly mangoes, citrus fruits, pineapple, bananas, tomatoes, and potatoes).
Duration: 5 years.
Cost estimate: Rs 511,000.

Major Iyengar of the Packaging and Containers Division indicated that he might submit proposals at a later date; however, I have not seen such proposals.

Inspection of Institution

CFTRI had been previously visited by Dr. Sam R. Hoover of UR&D in November 1955 and again on November 16-17, 1959, and by Dr. Arthur P. Sidwell of AMS on May 17-19, 1960; their excellent reports are available. It has also been visited on various occasions by Dr. Hilbert and Mr. Marston. Also, considerable background information on the institution is given in Dr. Subrahmanyan's statement that is quoted in Attachment 1. Accordingly, I shall defer preparing my own program notes until a later time. When finished, they will be supplied as an Attachment 2 to the present report.

Attachment 1 - Letter of November 23, 1960, Subrahmanyan to Detwiler

Attachment 2 - Notes on CFTRI (to be supplied later)

Attachment 1

CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE

Cheluvamba Mansion,
Mysore
November 23, 1960

Dear Dr. Detwiler,

With reference to our preliminary discussion this afternoon, I attach herewith two copies of a note which I would thank you and Mr. DeMoss to kindly go through and convey your comments when we meet again tomorrow morning.

I do not know the position about other Institutions, but so far as we are concerned, we would like a working arrangement that will help us to process things much faster than has so far been possible. I have made a realistic approach to the problem and feel that it will be to the mutual interests of the USDA and ourselves, if a simplified procedure can be evolved. Drs. Hilbert and Marston who visited us on previous occasions are also well aware of the position. We have in the past submitted several notes. We also had a number of discussions with the other colleagues such as those representing Wheat Associates, Dairy Science International, Soyabean Group and others. There were at least two projects which came to the stage of being signed, but no further progress was possible. We do not wish that a similar thing should happen again.

When dealing with Institutions like ours, there should be a more broad-based and generous approach. I would also like you to discuss the implications with other colleagues after you return to Delhi. The work of our Institute can be of further assistance to our Country and some value to USDA, if there is a liberal approach which need not necessarily infringe on the procedure that has been laid down by the U.S. Department of Agriculture. It may even be worthwhile stationing a Scientist colleague or other representative in Mysore who would take active interest in our work and help us in the best manner that is possible. Judicious expenditure of money, even in rupees, is very important, but it will be still more valuable to encourage talent and support new lines of thought, irrespective of cost involved.

Thanking you and Mr. DeMoss for kind consideration, I remain, with kind regards,

Yours sincerely,

/s/ V. Subrahmanyan

(V. Subrahmanyan)

Dr. Samuel B. Detwiler, Jr.,
Physical Science Administrator,
Agricultural Research Service,
United States Department of Agriculture,
CAMP: MYSORE.

Encl: Two

A Note Bearing on the Programmes of Work now in Progress at the Central Food Technological Research Institute, Mysore and a Possible Procedure for their Extension and Better Implementation with Further Assistance from the U.S.D.A. and Associated Bodies through PL-480 Funds.

The Central Food Technological Research Institute is one of the National Laboratories devoted to Food Science, Technology and allied subjects. The Institute has now a staff of about 600, including about 300 scientific workers at graduate and higher levels. Several of the senior staff have had advanced training in India and abroad and hold doctorate degrees. Many of the staff holding, even relatively junior posts, have had 10 years or more of research experience. The Institute has, under its wing, practically all the related discipline such as Biochemistry, Nutrition, Quality Control, Microbiology and Sanitation, Meat and Fish Technology, Fruit Technology including a teaching course and staff for quality control on behalf of Government, Grain Storage and Pesticide Research, Cold Storage, Gas Storage, and other lines of preservation, Food Processing including Cereal Technology and Dehydration, Dietetics and Field Research Organization (with a large animal house, facilities for human metabolism experiments, histopathological work etc.), Packaging and Containers, Food Engineering, Information, Statistics and Extension Services and an organization for eleven Regional Research Stations. In addition to these, the Institute also houses specialised research units for Coffee and Tea, Arecanut Technology, Coconut Technology, Oilseeds Research, etc. In addition to a fairly comprehensive Library, the Institute has a substantial assembly of Pilot Plant equipment and a good Workshop which is also equipped for the fabrication of equipment. The Institute is considered to be the biggest and the best equipped of its type not only in India but also in the whole of the Eastern region. There is already a proposal for setting up a Regional centre in the premises of this Institute for advanced training and research in Food Technology for Asia and the Far East. The present annual budget of the Institute is about three million rupees, including about a million rupees towards Capital Expenditure.

The Institute has on its approved programme, several lines of work which are expected to be of scientific and practical value not only for the Country but also to the other parts of the World. Some of the important lines of work have already found application, while a number of others are in the process of being developed for large scale utilisation. In addition to close association with different scientific organizations in the Country, the Institute is also associated with programmes under International Organizations like the Research Corporation (Williams-Waterman Fund), the UNICEF and other International Organizations. Some of the work done in the institute and, particularly in the production of protein-rich foods and the enrichment of cereals and tubers has been appreciated by International Organizations. The Protein Advisory Group of the U.N. Bodies has taken keen interest in the work done by the Institute on the production of vegetable protein isolates from oilseeds and oilseed meals and their utilization both by themselves and in suitable combinations for the treatment of protein malnutrition which is a serious problem not only for India but also to several other parts of the World. The contributions of the Institute towards the improved methods of processing rice,enrichment of wheat, millets and tuber flours, preservation of fruits and vegetables for fairly long periods

at ordinary temperatures, studies on the development of new pesticidal compositions which would be both economical and reduce pesticidal hazards, processing of vegetable proteins, utilization of certain agricultural wastes etc., will be of interest and value not only to India but also to the USDA.

With such a background, one may venture to suggest that the programme for assistance from the USDA should be in respect of projects of fundamental and practical significance and where extra assistance will encourage talent, strengthen man-power where necessary and provide more facilities that will help to quicken the progress. At the same time, it may be pointed out that there will not be much scope for any large recruitment of talented fresh staff or otherwise adding considerably to the existing strength. Most of the best available people in the country are already in the Institute. Our repeated experience has shown that it is very difficult to get highly qualified senior staff by open advertisement even for regular posts, let alone ad-hoc projects of relatively shorter duration. Moreover, the selection of such people, according to the procedure which we have to follow is rather complicated and it may not be possible to get suitable people especially for ad-hoc projects for a long time.

The best working arrangement would appear to be that of USDA assisting in the further development of worthwhile programmes through the Council of Scientific & Industrial Research. While there may be separate projects prepared in conventional form according to the requirements of the USDA, the inclusive funds may be placed with the CSIR with the request that in cases where it may be necessary, the Council may authorize the posting of promising workers for individual projects without affecting their lien on the regular service of the Institute. A certain number of posts in the junior ranks can then be filled up by advertisement. This will facilitate our regrouping of the staff so as to concentrate on promising programmes. Out of these, the necessary number may be nominated as Project Leaders subject to the overall supervision of the Director, the Deputy Director and the Heads of Divisions concerned. This will also enable us to encourage promising workers by giving better emoluments and affording scope for concentrated study. They will, at the same time, be secure with added sense of responsibility and an urge to show their capacity for leadership in their respective fields. In addition to this, a certain number of junior posts may be filled up by advertisement.

In actual practice, the above will amount to the projects being approved by the USDA, the necessary funds being then sanctioned and the inclusive amount placed at the disposal of the CSIR to be regranted to the Institute in addition to its normal budget. The CSIR should also be moved to authorize the necessary postings within the Institute without affecting the substantial postings of the scientists concerned. The provision should also include contributions towards the provident fund, leave salary and other amenities. If,as we hope, the above programmes are approved by the Council, it will be possible to make the necessary postings and to get the work started in a more intensive manner. Quick progress will then be possible. For practical purposes, the programmes will be those of the Institute, the results of which will also be reported to the USDA in the prescribed manner. Those involving patent rights or other protection need not be included in the programme as they may lead to complications in respect of adjudication.

Those selected for study should be such as can be published and made known to the whole world.

During the past two and odd years, several representatives including Senior Executive of the USDA and associated bodies have visited the Institute and expressed their interest in initiating programmes. Several plans were drawn up, but owing to some difficulty or other, they could not be initiated. As the object of providing assistance out of PL-480 is also to help National efforts, there will be need for a simplification of the procedure and elimination of various formalities. Whatever be the media and agencies for dealing with the projects, the ultimate concurrence of the CSIR will be needed. The procedure outlined above may fulfil the most essential requirements and it is hoped that it will be found to be acceptable to all concerned.

It is not clear as to whether any quick decision in respect of the basic principles can be reached, but there can be some indication of the feasibility of the proposal. I will discuss the principle with our Director General who is expected to visit Madras on the 29th of this month.

There are two aspects of the PL-480 assistance which I may touch on before I conclude. It will be in the interests of the programmes and also help to bring about a closer liaison between us and the USDA if there can be facility for our deputing promising workers associated with the projects to visit USA and to study the developments in allied lines. This was indicated by Dr. Hilbert himself when he last visited us. There should be provision for deputing a small number during each year for at least two or three months at a time. The other one relates to assistance in respect of specialised equipment which may not be available with us or can be easily fabricated and will, therefore, have to be imported from abroad. PL-480 Funds for India being a rupee account, any assistance given in this form will not help us to obtain any foreign exchange over and above the limited provision that is being made available to us towards our most urgent requirements (including replacements) by our Finance Ministry. Lack of facility in this direction will be a serious handicap. There should be at least some limited provision and this may kindly be further explored. If dollar provision is not available, it may be possible to get some sterling released through a similar organization operating in U.K. Alternatively, there should be facility for importing certain urgent requirements from such foreign countries as are prepared to accept payment in rupees. As the present assistance is from USA, we would prefer to get our requirement from that Country if a suitable working arrangement can be reached.

V. Subrahmanyan
Director
Central Food Technological Research
Institute, Mysore

November 23, 1960.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D. C.

June 21, 1961

TO: Guido E. Hilbert, Director, Foreign Research and Technical Programs Division

FROM: Samuel B. Detwiler, Jr., Special Assistant to the Administrator

SUBJECT: Foreign Travel, 1960 - Report No. 7
India: Central Leather Research Institute, Madras (November 25-26)

Mr. E. R. DeMoss and I visited the Central Leather Research Institute, Madras, on November 25 and 26, 1960. We held discussions with the following persons, among others:

Dr. Y. Nayudamma, Director
Dr. S. K. Barat, Assistant Director
Mr. N. Subramanian, Senior Scientific Officer
Mr. K. V. Karunakaran, Administrative Officer
Dr. Ing. K. Wolf of Rapperswil, Switzerland (UNESCO consultant to the Indian leather industry on a one-year assignment beginning 7/1/60)

During an inspection of the laboratories, we also met most of the principal research personnel.

Purpose of this visit was the negotiation of grants for the following research projects, which represented modifications of proposals received at the Embassy and transmitted to us in August, 1960:

UR-A7-(60)-17
Studies on the mode of reaction of polyphenolic tanning compounds with hide proteins (collagen) to obtain fundamental information for developing heavy leather with improved properties.
Principal investigator: Y. Nayudamma

UR-A7-(60)-18
Studies of the interrelation of hide quality with the rate of tanning and the efficiency of tanning, to obtain information for use in developing improved processes for making leather.
Principal investigator: Y. Nayudamma

Apparently the proposals were based on ideas developed in Utilization Research, and carried to the institution by Sam R. Hoover in November, 1959. They had been cleared by the Damle Committee at its first meeting on April 2, 1960; presumably a major factor in this clearance was the fact that Dr. Nayudamma had not requested items of non-expendable equipment involving foreign exchange.

Grant Negotiations

UR-A7-(60)-17. - Technical negotiations were conducted with Dr. Nayudamma on the basis of the Approval Copy of the cleared but unsigned research project. This represented a modification and expansion of the institution's proposal. Dr. Nayudamma accepted our plan of work as written. He had reconsidered his views on non-expendable equipment, and inserted a request for an infrared spectrophotometer and radioactive tracer apparatus, which we accepted. Dr. Nayudamma had on order an electron microscope, which is being paid for with the institution's funds.

Personnel assigned to this work was set at 3 professional man-years per year for 5 years, or 15 man-years in all.

UR-A7-(60)-18. - Technical negotiations were conducted with Dr. Nayudamma on the basis of the Approval Copy of the cleared but unsigned research project. This represented a modification and expansion of the institution's proposal. Dr. Nayudamma accepted our plan of work with the request that we add, at the end of the first paragraph, the following sentence: "Based on these investigations, an attempt will be made to evolve a suitable but simple technique to determine the actual leather-making substance in the raw hide." (This addition was later cleared within Utilization Research, and has been inserted in the project.) No special equipment was requested for this project.

Personnel assigned to this work was set at 3 professional man-years per year for 5 years, or 15 man-years in all.

Comments Applicable to Both Projects. - It was made clear to Dr. Nayudamma that grant negotiations were on a tentative basis, subject to clearance by the Damle Committee at New Delhi. Dr. Nayudamma indicated that the negotiations would have to be approved also by the Council of Scientific and Industrial Research.

Fiscal negotiations of both projects were conducted by Mr. DeMoss with Dr. Nayudamma and Mr. Karunakaran, the administrative officer. Dr. Nayudamma agreed to the General Grant Provisions, subject to clearance with CSIR, although in passing he questioned the patent provisions.

Dr. Nayudamma agreed to prepare revised proposals for the two projects, using our title, objective, and plan of work (in the case of A7-18, as modified during negotiations). To avoid any possibility of misunderstanding, I left him a skeleton outline of each revised proposal, having filled in the critical paragraphs. Also, for the information of the Damle Committee, I provided for indication that these were revised proposals, not new proposals, and that they had been negotiated by Mr. DeMoss and me.

In a letter to me at New Delhi, dated December 2, Dr. Nayudamma sent me information copies of both revised proposals, and indicated that he was sending 15 copies each to the CSIR for forwarding to the Damle Committee. Subsequently, the same proposals were received through channels by Dr. Oman and forwarded to FRTPD/Washington with his memo of January 16, 1961. They were cleared by the Damle Committee at its meeting of April 21, 1961.

It is noted that in the institution's revised proposals, the cost of a trip to the United States (13,000 rupees) was not included in either proposal, but rather as an appendage in a summary of cost estimates; on the other hand, in his reports of fiscal negotiations, Mr. DeMoss included half the cost of the trip under each project. In either case, the total cost of both grants, including the trip, is the same--309,000 rupees.

Background material relating to these proposals was supplied to Dr. Oman on April 4.

Dr. Nayudamma named himself as the principal investigator in each case, although no part of his salary will be charged to the grants.

Since the time of my visit, I have not been in correspondence with the institution, inasmuch as there were no loose ends to clear up.

Status and Indicated Action. - For each project, a revised proposal has been received from the institution and found to be in good order; Mr. DeMoss' report of fiscal negotiations and my report of technical negotiations have been prepared; and the Approval Copy of the project is being prepared for formal approval by UR&D and transmittal to FRTPD. Also, revised proposals for both projects were approved by the Damle Committee at its meeting of April 21, 1961. Accordingly, upon receipt of the approved projects, it would be appropriate for FRTPD to prepare the grant letters and send them overseas for concurrence.

Other Research Ideas

I had with me no Research Problems that were suitable for offer to CLRI; and during my inspection of the laboratories, no suggestions for additional research were offered to me. We do have a clear picture of the Institute's program and facilities; and I feel that after the grants for projects A7-17 and A7-18 have been executed and have made appreciable progress, it will not be difficult to develop additional projects of mutual interest.

Attachment 1 - Notes on the Central Leather Research Institute
Attachment 2 - Outline of CLRI Research Program for 1960-61
Attachment 3 - Miscellaneous Observations on Program Developments
Attachment 4 - Equipment Noted at CLRI
Attachment 5 - CLRI Publications Supplied to EU's Hides and Leather Laboratory

Attachment 1

NOTES ON THE CENTRAL LEATHER RESEARCH INSTITUTE

(The Institute was visited also by Sam R. Hoover on November 20-23, 1959. See his trip report, pp. 9-10.)

The Central Leather Research Institute is one of numerous institutions (currently 26) controlled by the Council of Scientific and Industrial Research. It was established in January, 1953, to improve the situation of the Indian leather industry through basic and applied research, the training of leather technologists, and the dissemination of technical knowledge.

The Institute occupies a sizeable tract of land on the outskirts of Madras, near the Department of Technology of the University of Madras. There are a modern main building, perhaps half of the size of a Regional Laboratory, and sundry auxiliary buildings. Quarters for some of the staff are provided on the property.

The Institute was established and equipped with a grant of Rs 3.5 million (about $740,000), and is maintained with an annual grant of Rs 650,000 (about $135,000). The staff numbers about 100 persons, of whom perhaps 80 are technically trained. The breakdown of the scientific staff for fiscal year 1959-60 showed 15 senior scientific officers; 11 junior scientific officers; 32 scientific assistants (senior and junior); 10 laboratory assistants (senior and junior); and 9 research fellows (senior and junior).

Director of the Institute, apparently since about 1956, is Dr. Y. Nayudamma, a young and very intelligent man whose progressiveness sometimes startles his governmental and industrial associates. Nayudamma spent the period 1947-52 in the States, receiving the M.S. and Ph.D degrees in chemistry from Lehigh University. During this period, also, he spent 18 months at hard manual labor in Pennsylvania tanneries, learning American hides and leather practice from the ground up.

The problems that Nayudamma faces are illustrated by the following discussion.

India is the world's largest single holder of livestock. According to the Stateman's Year-Book, the 1956 livestock census included 159 million cattle, 45 million buffaloes, 39 million sheep, and 55 million goats. (These figures are corroborated by statistics from the Indian Ministry of Food and Agriculture, and recent FAS statistics.) From this population, there are annually produced (according to CLRI figures) 16 million cow hides, 5 million buffalo hides, 14 million sheep skins, and 22 million goat skins. The value of this output (including finished leather as well as raw material) is estimated at Rs 400 million.

With particular reference to cattle hides, several factors contribute to low quality in the raw material. Because of restrictions on slaughter of cattle, about 95 percent of the supply of cow hides comes from "fallen" stock, that is, animals that have died of disease or old age. Also, Indian cattle are habitually undernourished; and they appear to be prey to more than their share of such pests as the warble fly, that cause damage to hide quality.

A second problem is tied in with governmental efforts to improve India's position in world markets. Traditionally, India has exported hides and skins in raw or semi-finished condition, and bought back a considerable amount of finished leather; the present policy is to increase the extent to which the hides and skins are processed at home. Also, India imports annually about Rs 20 million worth of tanning agents and leather auxiliaries; it is desired to produce these supplies from indigenous raw materials.

A third problem involves overcoming the inherent conservatism of Indian tanners, who are reluctant to try out new ideas without convincing proof of their feasibility.

Nayudamma's approach to these problems, which reflects his training in the States, involves a sizeable amount of fundamental research, numerous short-term projects of an applied nature, and much extension work with large tanneries, small tanneries, and cottage industries. The progressiveness of his methods is illustrated in the following examples:

(1) I first met Nayudamma at the Bangalore airport, whence he was returning to Madras from an inspection of a commercial tannery. This tannery, with an annual business of Rs 2.5 million, had been on the verge of failure the year previously, partly because of poor management practices and partly because of lack of technical know-how. As an experiment to find out what a scientist is really good for, Nayudamma had taken over operation of the tannery and had put it on a paying basis; in another year or so he expected to return it to the hands of the owners.

(2) Following up on its research development, the Institute is currently preparing and packaging spray-dried tannin concentrates, suitably blended for particular purposes, and selling them to tanneries. It will get out of the business as soon as commercial firms can be convinced that the enterprise is profitable.

Although the Institute has laboratories for particular disciplines--biochemistry, bacteriology, physics, etc.--the research is organized by interdisciplinary teams, or "units," each team being concerned with a broad project corresponding to a work project in our nomenclature. There are six research teams, as follows: I, Raw Hides and Skins Unit; II, Vegetable Tannage Unit; III, Mineral and Other Tannage Unit; IV, Leather Auxiliaries Unit; V, Byproducts Unit; VI, Engineering Unit. Each unit is assigned specific sub-projects of limited duration, corresponding to our line projects. Nayudamma himself is leader of two of the units; and in other units he takes part as an ordinary researcher, submitting regular progress reports along with the other workers. A precis of the program for 1960-61 is given in Attachment 2.

As previously indicated, the dissemination of scientific information plays an important part in the Institute's activities. Units have been established to deal with survey and information, extension services, technical services, technical training, and publications. Additionally, three other units, dealing with leather economics, leather goods manufacturing, and productivity and scientific management, were being organized at the time of my visit.

Administrative services are simply organized according to "establishment" (housekeeping), accounts, and "works purchase."

Program development and evaluation are handled by three "cells," as follows:

(1) The Problem Processing Cell, with the Assistant Director as chairman, collects problems from the Information and Survey Unit, the extension staff, industrial tanners who are in contact with the Institute, and Institute staff members, etc., evaluates them, and assigns priorities.

(2) The Coordination Cell, headed by the Director, correlates the Institute's activities with those of outside organizations, such as the Forest Research Institute and the Leather Export Promotion Council.

(3) The Project Evaluation Cell has a leading tanner as chairman, various outside tanners and scientists as members on an ad hoc basis, and the Director as secretary. It evaluates the accomplishments of the various research units.

Policy guidance to the CLRI program is given by an Executive Council, whose chairman is the vice-chancellor of Madras University, and whose 15 other members are representative of tanneries, trade associations, universities, and government agencies, including the Council of Scientific and Industrial Research. Under this Council is a six-man Scientific Sub-Committee.

Much of the Institute's research output is published in its Bulletin, a monthly periodical that in 1960 was in its seventh volume. Other outlets include Altech, Tanner, and Journal of the Indian Leather Trades Association.

As part of the program of its Training Unit, the Institute trains students for the B.Sc. (Tech.) Degree in Leather Technology, as well as for higher degrees. I understood that this service is offered in collaboration with the Department of Technology of Madras University, which is located near at hand to CLRI.

Mr. Subramanian took us on a comprehensive tour of the Institute's research facilities. Although time did not permit extended discussions with individual research workers, I was impressed by their apparent grasp of the significance of the problems on which they were working. I was also impressed by the up-to-dateness of the equipment, much of it supplied by TCM.

Attachment 2 contains an outline of the Institute's research program for 1960-61. Attachment 3 contains miscellaneous supplementary observations on program developments. Attachment 4 lists some of the equipment observed during my inspection, with an indication of source where known. In Attachment 5 is a list of CLRI publications that are being supplied to Dr. Naghski of EU's Hides and Leather Laboratory.

Attachment 2

OUTLINE OF CLRI RESEARCH PROGRAM FOR 1960-61

I. Raw Hides and Skins Unit

1.0 Survey (of conditions and practices in various regions) and sampling (of hides and skins from dead and slaughtered animals).

2.0 Histological studies.
- 2.1 Hides and skins collected from Bihar and Andhra Pradesh.
- 2.2 Reptile and fish skins.
- 2.3 Preparation of a histological album of hides and skins.

3.0 Biochemical studies.
- 3.1 Protein and lipid constituents of hides and skins from Hyderabad and Bihar regions.
- 3.2 Biosynthesis and metabolism of collagen.
- 3.3 Structural amino acid sequence in collagen.
- 3.4 Interchain linkages in collagen.
- 3.5 Specificity of enzymes capable of hydrolyzing collagen and other skin proteins.

4.0 Preservation of hides and skins.
- 4.1 Curing with newer antiseptics in admixture with common salt.
- 4.2 Solvent dehydration.

5.0 Bacteriological studies.
- 5.1 Hides and skins collected from Andhra Pradesh and Bihar.
- 5.2 Isolation and identification of microorganisms from raw hides and skins collected.
- 5.3 Isolation and identification of the pigments of halophilic bacteria.

6.0 Defects in hides, skins, and leather.
- 6.1 "Rainy season defects" (weather rot) in skins.
- 6.2 Rendering skins (from animals dead of infectious diseases) innocuous in handling, without affecting leather-making properties.
- 6.3 Insect damage to stored hides and skins and its prevention by insecticides.
- 6.4 Prevention of mold growth in leather.

7.0 Leather-making properties.
- 7.1 Leather-making properties of hides and skins collected from Bihar and Andhra Pradesh.
- 7.2 Leather-making properties of hides and skins not yet commercially exploited (shark skin, frog skin, etc.).

8.0 Aging properties of raw hides shipped from abroad, vis-a-vis the lowering of their tensile strength.

II. Vegetable Tannage Unit

1.0 Survey of the availability of tanstuffs in the various regions of India.
- 1.1 Collection and analysis of authentic samples of indigenous tanstuffs, for study of the effect on quality of such factors as age, climatic conditions, collection and handling methods, etc.

1.2 Assessing promising substitutes for wattle from indigenous tanstuffs, and working out suitable processes for their full utilization.
1.3 Microscopical examination of the Indian vegetable tanning materials, babul and avaram.

2.0 Intensive studies of some abundantly-available tanning materials, to improve their tanning characteristics.
2.1 Organic chemistry of vegetable tannins (isolation, purification, and constitution of tannins of dhawa, avaram, divi-divi, and babul).
2.2 Biogenesis of vegetable tannins of myrobalan, dhawa, avaram, divi-divi, and babul.
2.3 Effect of plant hormones on tannin-bearing plants.
2.41 Separation of tannins and non-tannins and further fractionation of their constituents by physico-chemical methods.
2.42 Studies on certain physico-chemical characteristics of vegetable tannins and their fractions, such as molecular size, molecular weight, degree of hydration, and charge.
2.51 Affinity of tannins and their fractionated polyphenolic constituents for protein substrates and their stability with special reference to mechanism of tannage.
2.52 Studies on the nature of reaction of some of the principal Indian vegetable tannins with various forms of proteins and non-protein substrates, with particular reference to the stability of the various tanned products against specific denaturing agents.
2.6 Application of instrumental tools, such as spectrophotometry, polarography, and non-aqueous titration techniques, to the study of the fractions obtained from Project 2.1.
2.7 Nature of tannin in myrobalan and its potentiality as a self-sufficient tanning material.
2.8 Enzyme systems of avaram, babul, konnam, divi-divi, myrob, and dhawa.
2.9 Fungi in tan liquors.
2.91 (a) Isolation and identification of species of Aspergilli and Penicillia growing in vegetable tan liquors. (b) Physiological studies--effect of pH and tannin concentration on the growth of these fungi in myrob and wattle extract.
2.92 Utilization of tannin and non-tannin phenolic constituents of tan liquors, and the corresponding growth of fungi therein.
2.93 Growth of Aspergilli in tan liquors in the presence of fungicides.

3.0 Vegetable tannin extracts.
3.1 Study of the manufacture of vegetable tannin extracts from indigenous tanstuffs, alone or in blends. (Determination of optimum conditions for leaching and manufacture of extracts, and pilot plant production.)
3.2 Use of vegetable tannin extracts for purposes other than tanning, e.g., in boiler compounds, antirusting compounds, resins, finishes, etc.

4.0 Nature of tannins in the arecanut.

5.0 Studies on principles of tannages.
5.1 Principles of heavy and light leather vegetable tannage, with special reference to indigenous oak and kaphal.
5.2 East India tanning.

6.0 Modification of existing processes with a view to reducing the cost of tanning and improving the quality of leathers.
- 6.1 Rapid tannage of sole leather.
- 6.2 Trials of various indigenous tanning materials in vegetable tanning.
- 6.3 Improvements in bag tanning process.

7.0 Finding new uses for leather. (Dressing of East India leathers--kips for upper and skins for semi-chrome, semi-alum glazed kid leathers, with special reference to the use of basic aluminum sulfate.)

8.0 Effect of aging on vegetable tanned leathers, such as belting.

9.0 Correction of undertanning in the neck portion in vegetable tanning of dry buff hides from Singapore. Removal of defects caused by growth marks on leathers made from dry imported buff hides.

10.0 Dyeing vegetable tanned leather without bleeding.

III. Mineral and Other Tannage Unit

1.0 Chemistry of the complex nature of chrome, aluminum, and zirconium salts.

2.0 Combination tannages.
- 2.1 Aluminum-vegetable.
- 2.2 Zirconium-vegetable.
- 2.3 Syntan-vegetable.

3.0 Oil tannages.
- 3.1 Fish oil tannage.
- 3.2 Tannage with sulfochlorinated oils.
- 3.3 Combination tannages using oils with vegetable tannins.

4.0 Study of the syntans and their production on a pilot-plant scale.

5.0 Aldehyde tannages, such as dialdehyde starch, glutaraldehyde, etc.

6.0
- 6.11 Manufacture of industrial leathers (belting, hydraulic, and oil seal).
- 6.12 Effect of aging on the properties of picking bands made from chrome retan leathers.
- 6.2 Manufacture of cycle saddle leather.
- 6.3 Scientific study of leathers used for water buckets.

7.0 Manufacture of special types of leathers.
- 7.1 Light leathers, particularly gloving leathers.
- 7.2 Leathers for sports goods (footballs).
- 7.3 Improvements in chrome and chrome retan upper leathers.
- 7.4 Shrunken grain kid and side leathers.

8.0 Correlation of chemical, physical, and microscopical properties of leather, and preparation of standard specifications for Indian Standards Institution.
- 8.1 Physical and microscopical data.
- 8.2 Chemical data.

9.0

9.1 Swelling, shrinkage, and optical properties (birefringence) of untanned and tanned collagen.
9.2 Affinity of leathers from different tannages for dyestuffs.

10.0 Microscopy as an analytical tool for process control.
10.1 Determination of degree of tannage.
10.2 Detecting fallen hides.

11.0 Finishing of leathers in oriental designs and screen printing.

12.0 Preparation of heat-resistant chrome leather for vulcanized shoes.

13.0 Hides and skins for musical instruments.

IV. Leather Auxiliaries Unit

1.0 Fatliquors.
1.1 Preparation and use of cationic, anionic, and nonionic fatliquors from (a) indigenous vegetable oils (pinnay, tobacco seed, coconut, cottonseed), (b) fish oil, and (c) synthetic leather oils.
1.2 Pilot plant production of fatliquors.
1.3 Exploratory studies on suitable vegetable oil substitutes for sperm oil and neatsfoot oil.

2.0 Formulation and evaluation of leather finishes.
2.1 Water-based finishes.
2.2 Resin finishes.
2.3 Glossy finishes.

3.0

3.1 Natural and synthetic polymers for impregnation and finishing.
3.2 Impregnation of upper and other leathers with resin emulsions, etc., to make them fireproof, and/or for electrical insulation.

4.0

4.1 Shoe polishes, stains, and adhesives.
4.2 Shoe dressings, welting cement, etc.
4.3 Pilot plant manufacture of polishes and adhesives.

5.0 Chrome aluminum stearato complexes for shower-proofing of clothing leather.

6.0 Detergents from soap-nuts.

7.0

7.1 Biochemical and physico-chemical properties of certain bate and depilatory enzymes.
7.2 Specificity studies on depilatory enzymes.
7.3 Pilot plant manufacture of enzymatic bates and unhairing agents.

8.0 Pilot plant production of synthetic leather oils.

9.0 Pilot plant production of hide powder.

10.0 Pilot plant production of basic aluminum sulfate.

11.0 Pilot plant production of vegetable tannin extracts.

12.0 Testing and standardization of leather finishes and finished leathers.

13.0 Large-scale tannery trials of CLRI leather auxiliaries.

V. Byproducts Unit

1.0

1.1 Manufacture of leather boards (a) from chrome leather shavings, (b) from v/t leather trimmings, (c) in admixture with rags, jute, etc., and (d) with vulcanization.

1.2 Pilot plant production of leather boards.

2.0 (a) Salvaging, acid washing, and bleaching and disinfection of tannery wool and goat hair. (b) Physical properties of tannery wool and hair--effects of crosslinking treatments.

3.0

3.1 Utilization of tannery offal, fleshings, and hair for recovery of amino acids.

3.2 Gut and surgical sutures from animal intestines and fish fin rays.

3.3 Production of gallic and tannic acids from myrobalan wastes of extract factories.

3.4 Physico-chemical properties of glue and gelatin manufactured from indigenous raw materials.

3.5 Curing, processing, and sterilization of intestines of cows, buffaloes, etc., for the manufacture of sausage casings.

4.0 Tannery effluents--their treatment and disposal.

5.0 Leather goods from fancy leathers, split leathers, etc.

VI. Engineering Unit

1.0 Planning and construction of buildings, and providing necessary auxiliary services (light, current, etc.).

2.0 Setting up and maintenance of machinery and equipment in the tannery, workshop, and laboratories.

3.0 Design, development, and construction of (a) new tools and instruments for research and (b) new tools and machinery for the leather industry.

Attachment 3

MISCELLANEOUS OBSERVATIONS DURING INSPECTION OF LABORATORIES

The program outline in Attachment 2 gives a fairly adequate idea of CLRI's research activities. Below are some additional notes on activities of particular interest to me, as observed during my inspection of the laboratories.

Throughout the laboratories, I found much evidence of Nayudamma's desire to help in improving India's trade balance, by reducing exports of raw hides and skins, with a corresponding increase in the amount of processing conducted at home.

The emphasis placed on local tanning materials is another indication of the desire to improve India's trade balance. They appeared to be particularly interested in tamarind, of which the seed husks contain 24 percent of a catechol-type tannin, while the extract contains 56 percent of tannin; other applications, such as water softening and drilling muds, are being given incidental attention. The pilot plant for tanning extracts appeared particularly well equipped. In connection with this plant, work is going forward on development of aliphatic sulfonated chlorides as a replacement for shark and cod oils (e.g., for tanning chamois leather); the latter are produced locally and are not always of good quality.

Another source of tannin is the areca nut, or betel nut, which is widely used in India for chewing purposes, both as a stimulant and as a digestive; also, women consider it a beauty aid, since it stains the lips red. Although the nuts are sometimes used raw, in some localities they are cooked to remove the constituent catechols, which comprise up to 25 percent of the nut. Nayudamma has a serious interest in the tanning properties of these catechols, either as recovered from the cooking liquors or from scrap nuts.

The Institute appears to be equipped for fairly large-scale production of synthetic tannages by sulfonation of coal-tar derivatives and condensation with formaldehyde; these syntans are considered to be particularly good for shrunken grain leather. Some of them are of the bleaching type, while others are intended to replace vegetable tannages.

The Institute's applied tanning studies are concerned not only with drum tanning and vat tanning, but also with bag tanning, an old method practiced by village tanners. Here a hide is stitched into a bag, and the tanning liquor placed inside.

A rather intensive fundamental study of collagen is under way. They feel that in the tanning operations, polyphenol crystals are deposited on the collagen in an oriented fashion, with the small crystals laid down along the fiber axis, and the large crystals cross-linking the collagen. Cross-linking is related to the shrinkage test; i.e., a lowering of the shrink temperature means loss of cross-links. The same laboratory is attempting to prepare pure hide proteins other than collagen.

In a study of "red heat" in hides, the bacteriology laboratory is isolating the pigments responsible for the bright red coloration, and studying their influence on hide quality. They advised me that Sarcina litoralis is the responsible organism. They consider that bacterial damage is not appreciable, it being the color that reduces the value of the hide. They were not yet sure whether the pigment actually stains the hide.

In one of the biochemistry laboratories, they have been working on a mold enzyme from Aspergillus parasiticus, for use after lime dehairing to remove globular proteins for certain types of leather, without affecting the collagen; it is cultured on wheat bran. Also, an enzyme bate is now ready for commercialization; it works at pH 8 to 8.5, which means little change in present tannery practice.

As an adjunct to the tannery operations, the Institute has ample cold storage facilities for preserving raw buffalo and cow hides prior to processing.

Research on leather auxiliaries was considerably in evidence. For example, they are working on the modification of pongam oil as a substitute for neats foot oil; proteins that will supplement casein in leather finishes; protein binders for pigments; synthetic resin finishes from indigenous raw materials; and sugarcane wax for finishes and for shoe polish.

Sun-drying of hides, a common practice, is considered to have an adverse effect on hide quality, and causes difficulties in "soaking back". Accordingly, studies are going forward on drying with acetone and other solvents.

In the field of mineral tannages, one of the chemistry laboratories is doing considerable work on salts of zirconium and berillium as well as of chromium. India is a producer of aluminum berillium silicate.

Among specialty products with which the Institute is experimenting, I noted python skin leather and frog skin leather. India ships frog legs to France; and Nayudamma had got hold of an experimental batch of skins for evaluation of their tanning properties.

Intensive entomological studies are going forward on insects affecting the quality of hides and skins. The warble fly is the most serious of these pests; the hide beetle is another. They have worked out complete life cycles for some of the insects.

As an example of short-term service problems undertaken for industry, CLRI traced the cause of certain imperfections appearing on the hair side of sheepskins, and found them due to the barbed arms of various weeds that penetrate the skin of the living animal.

Attachment 4

EQUIPMENT OBSERVED AT CLRI

(Some of the equipment was marked as having been given by TCM (ICA in India. I was told that it had been received about two years previously.)

Endless knife for splitting hides.

Setting machine for folds and creases.

Spray drier for tannin extracts.

Staking machine, for softening and stretching after drying.

Belting machine for preparing round belts (TCM).

Rolling machine for compressing sole leather (Turner Tanning Machine Corp., Leeds; not a TCM donation).

Stretching machine for belting leather (TCM).

Buffing machine for producing nap.

Glaze machine for application and polishing of plastic finishes.

Hydraulic press with dies for impressing grainy finishes.

Integrating machine for determining area of hides.

Drying unit involving pasting on glass sheets to save nail holes.

AMINCO machine for testing wearing properties of sole leather; it was designed for use with rubber, and adapted to leather.

Taber "Abraser" for abrasion resistance of light leathers.

Mullen bursting strength tester (TCM).

Scott tensile strength tester, max. 500 lb. (TCM).

Avery tester, max. 4,000 lb.

Olsen stiffness tester (TCM).

Beckman viscometer.

Beckman service meter for calibration of pH meters.

Tinsley polarograph.

Homemade gas chromatography apparatus currently under construction.

Chr. Becker specific gravity balance.

Fisher auto titrator for moisture determination.

Hilger polarimeter.

Beckman comparative microscope.

Attachment 5

CLRI PUBLICATIONS SUPPLIED TO EU HIDES AND LEATHER LABORATORY

CLRI annual report, 1959-60.

Symposium on East India tanning industry and tanning agents, July 6-8, 1955 (proceedings and technical papers). CLRI, Madras, 1956.

Symposium on raw hides and skins--curing and preservation, March 28-30, 1957 (proceedings and technical papers). CLRI, Madras, 1958.

Symposium on leather auxiliaries, March 14-17, 1958 (proceedings and technical papers). CLRI, Madras, 1959.

Symposium on tanning as a small scale and cottage industry, February 15-17, 1959 (proceedings and technical papers, in two volumes). CLRI, Madras, 1959.

Symposium on utilization of by-products of leather industry, February 10-12, 1960 (proceedings and technical papers). CLRI, Madras, 1960.

Processes for the manufacture of glazed kid. CLRI Bulletin No. 2, 1957.

Manufacture of roller skins. CLRI Bulletin No. 3, 1956.

Fish oil of the west coast of Madras for the Indian leather industry. CLRI Bulletin No. 4, 1956.

Rapid tannage of sole leather. CLRI Bulletin No. 5, 1957.

Manufacture of East India tanned kips using a blend of karada and konnam barks in place of mimosa bark and extract. Practical Demonstration No.7. Reprint from CLRI Bulletin 4, No. 4, November 1957.

Rapid E. I. tanning of goat and sheep skins. Practical Demonstration No. 7. Reprint from CLRI Bulletin 4, No. 6, January 1958.

Improvements in curing and preservation of skins and hides. Reprint from CLRI Bulletin 4, No. 12, July 1958.

CLRI Bulletin 7, No. 2, September 1960.

Let's look at leather! Leaflet of Council of Scientific and Industrial Research, New Delhi, undated.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D. C.

July 25, 1961

TO: Guido E. Hilbert, Director, Foreign Research and Technical Programs Division

FROM: Samuel B. Detwiler, Jr., Special Assistant to the Administrator

SUBJECT: Foreign Travel, 1960 - Report No. 9
India: University of Allahabad, Allahabad (December 1-2)

Mr. E. R. DeMoss and I visited the University of Allahabad on December 1 and 2, 1960. Principal purpose of this visit was the negotiation of grants for the following projects:

UR-A7-(10)-9
Collection and isolation of molds belonging to the order Mucorales, and classification of the isolates, in order to find microorganisms suitable for fermentative processes of importance in cereal grain utilization.
Principal investigator: Dr. B. S. Mehrotra, Assistant Professor, Botany Department

UR-A7-(10)-10
A study of survival and possible genetic change in industrially useful microorganisms subjected to lyophilization, to obtain basic information needed for the maintenance of culture collections for industrial fermentation of cereal grains.
Principal investigator: Dr. B. S. Mehrotra, Assistant Professor, Botany Department

UR-A7-(10)-14
Electron microscope studies of the proteinaceous matrix in which starch granules are imbedded in the endosperm of wheat kernels, to obtain basic information needed for better milling separations to increase the utilization of wheat.
Principal investigator: Dr. Vishwambhar D. Gupta, Assistant Professor, Physics Department

In preparing for this visit, we had written and telegraphed to Dr. K. Banerjee, Dean of Science, the principal person contacted by Dr. Sam R. Hoover of UR&D during his visit to the University on October 21-22, 1959. However, upon arrival at Allahabad we found that Dr. Banerjee had left the University to accept a new assignment in Calcutta, and our correspondence had gone astray. We phoned Dr. Mehrotra, who came to the rescue; and with the help of a bicycle, a tonga (two-wheeled horse cart), rickshas, and a vintage taxicab we proceeded with our mission.

I saw no evidence of any centralization of the scientific departments at the University. Dr. Mehrotra served as our intermediary in making appointments.

Negotiation of Projects UR-A7-(10)-9 and UR-A7-(10)-10

Both projects originated in ideas developed at the Northern Regional Research Laboratory and carried to the University by Dr. Hoover at the time of his visit. Subsequently, the University submitted "short-form" proposals which amounted to expressions of interest in doing the work. Thereafter, UR&D expanded the original ideas into the Research Projects that we used as a basis for negotiations.

Technical negotiations were conducted with Dr. Mehrotra, who accepted the plan of work of both projects without modification. Fiscal aspects of the grants were discussed with Dr. Mehrotra and his supervisor Dr. R. N. Tandon, head of the Botany Department. Dr. Tandon expressed complete sympathy with the P. L. 480 research program. He cleared the general grant provisions, and indicated that he would do all that he could to have them approved by the University's Executive Council.

Dr. Tandon indicated that funds for the purchase of equipment were scarce, and expressed some hesitancy about the University's share of the cost of two microscopes needed for the work. We attempted to show, with limited success, that the portion of Dr. Mehrotra's salary to be charged to the grant could be used to offset the cost of equipment, if the University so desired. Apparently the question was satisfactorily resolved subsequent to our visit.

Dr. Tandon had no comments on the plan of work of the two projects. Apparently his staff members have free rein in developing their scientific programs.

It was made clear to Dr. Mehrotra that grant negotiations were on a tentative basis, subject to clearance by the Damle Committee in New Delhi.

Research assistants needed for the two grants will presumably be provided from Dr. Mehrotra's graduate students. Currently he had six students, five working for the Ph.D. degree and one for the M.Sc. degree.

Dr. Mehrotra spent about 10 months at the Northern Regional Research Laboratory in 1957, and is well acquainted with the staff of NU's Fermentation Laboratory. During our discussions it became apparent that the possibility of revisiting the Northern Laboratory was a very attractive feature of the grant provisions, as far as Dr. Mehrotra was concerned, and was perhaps the key to his acceptance of the grants. At his urging, we earmarked funds for two trips to the States, one under each grant, although we pointed out that final approval of such travel would have to come from the Director of FRTPD. It was felt that one trip would be desirable about a year after the beginning of the work, for orientation purposes, and the second trip at a later time, for discussion of research results.

Dr. Mehrotra agreed to prepare revised proposals for the two projects, using our title, objective, and plan of work. To avoid any misunderstanding, I left him a skeleton outline of each revised proposal, having filled in the critical paragraphs. Also, for the information of the Damle Committee, I provided for indication that these were revised proposals, not new proposals, and that they had been negotiated by Mr. DeMoss and me.

Information copies of the two revised proposals were forwarded with Dr. Mehrotra's letter of December 12 to me in New Delhi. Additional copies were sent through the Ministry of Food and Agriculture to the Agricultural Attache, thence from Dr. Oman to Dr. Hilbert with memo of December 30. The plan of work of the proposals corresponds with the projects, apart from some inconsequential editing by Dr. Mehrotra.

Dr. Oman was some time ago provided with a setup including copies of projects, the original proposals, and pertinent background correspondence.

Status and Indicated Action. - The negotiators' reports of technical and fiscal negotiation have been prepared. The University's revised proposals, conforming to agreements reached during negotiations, were cleared by the Damle Committee on April 21, 1961. Accordingly, UR&D has approved the research projects and has recommended that FRTPD prepare and forward grant letters for the University's concurrence.

Physics Department Projects

Dr. S. Ghosh is head of the Physics Department. We were prepared to negotiate a grant for project UR-A7-(10)-14 (see title above), which represented a modification of a proposal on X-ray and electron microscope studies of cellulose and protein fibers, submitted by Dr. Vishwambhar D. Gupta, Assistant Professor of Physics. However, I was advised that Dr. Gupta had left the University for several years of study at Princeton University, and that no one in the Department was in a position to carry on in his stead. Accordingly, I did not visit the Physics Department, spending the available time in the Chemistry Department instead (see below).

As of July, 1961, Dr. Gupta was still at Princeton, according to information received by Mr. duPre of UR&D. In the interim, the Northern Laboratory acquired an electron microscope and desired to conduct at least part of the projected study in-house; accordingly, UR&D has withdrawn the project.

Dr. G. S. Verma, also of the Physics Department, had sent us proposal UR-A7-(20)-15, concerned with ultrasonic absorption measurements in organic liquids at frequencies below 1 mc. I sent word to Dr. Verma that a project for this proposal was progressing favorably, in somewhat modified form. (The project has now been cleared for grant negotiations.)

Notes on the Botany Department

The Botany Department is staffed as follows: Prof. R. N. Tandon (Ph.D. London), Head. Dr. B. S. Mehrotra, Mr. G. D. Srivastao, Mr. N. S. Parihar, Dr. M. P. Tandon, Dr. K. S. Bilgrami, Dr. A. K. Mitra, Dr. D. D. Pant, Dr. Niraiyan Das, Dr. M. M. Laloriya, and one vacancy. Graduate students are numerous.

Representative research under way in the Department includes studies of the pathway of tartaric acid production in tamarind; the effect of phosphorus deficiency in the amino acid metabolism of plants; the effect of auxins on seedling growth; castor bean physiology; the role in nitrogen fixation of algae from soils of the Allahabad region; and isolation of new species of Chlorogia (?). Much work on linseed is going forward. They appear to be well versed in the use of paper chromatography.

In addition to our two utilization research proposals, Dr. Tandon and others in the Botany Department had submitted five other proposals for research within the purview of other agencies (A7-CR-30, A7-SWC-7, A7-SWC-8, A7-AMS-6,A7-AMS-7); on the Washington end, I understand that one of these, on soil algae of rice fields, is ready for grant negotiations.

Notes on the Chemistry Department

Mrs. Radha Pant, head of the Department*, is a petite woman with great driving force who appears to have done a remarkable job in building up a research program on a shoestring. She receives few funds from the University; most of her support has come from outside agencies, such as the University Grants Commission, the Council of Scientific and Industrial Research, and the Uttar Pradesh Government Research Grants Committee. The staff is limited, but of apparent competence; space is not plentiful. Some items of good equipment were in evidence, including a Unicam infrared spectrophotometer, a Sartorius electrically-operated single-pan balance, and an automatic fraction collector made in Poona; also, there is a special room for electrophoresis and paper chromatography.

Mrs. Pant's principal interest is in the biochemistry of wild plants; and in this connection she had previously sent us a proposal (tentative number UR-A7-(00)-a),concerned with the protein and amino acid composition of Indian legumes. UR&D had not accepted this proposal, chiefly because of conflict with the 104(k) project UR-A7-(00)-1(k), for which we had hoped to negotiate a grant with Dr. A. Sreenivasan at the Central Food Technological Research Institute in Mysore. Since the time of my visit, UR&D has reconsidered the situation and is currently attempting to develop a counterproject that will qualify for 104(a) funds and at the same time be of interest to Mrs. Pant.

Other interests of Mrs. Pant include studies on phosphagens and isolation and identification of guanidine derivatives of animal origin; biochemical studies of the blood of animals of different species; plant latex; and studies on insect biochemistry. In 1959 she submitted a P. L. 480 proposal on the latter subject (A7-ENT-14) which went to Entomology for evaluation. She has 20 original research papers to her credit.

Mrs. Pant ranks high on the list of Indian scientists whom I would like to see associated with the P. L. 480 research program.

*According to advice at the time of my visit. In documents previously received by FRTPD, she was described as Assistant Professor of Biochemistry in charge of the Biochemistry Section, Chemistry Department.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D. C.

March 1, 1961

TO: Guido E. Hilbert, Director, Foreign Research and Technical Programs Division

FROM: Samuel B. Detwiler, Jr., Special Assistant to the Administrator

SUBJECT: Foreign Travel, 1960 - Report No. 10
India: National Dairy Research Institute (December 3)

While in India I was prepared to visit the National Dairy Research Institute at Karnal, to negotiate a grant for the following project:

UR-A7-(60)-11
Investigations of sulfur compounds in milk and milk products, and their relation to "cooked" flavors and oxidative stability, to obtain fundamental information needed in the preparation of high-quality, stable milk products.
Principal investigator: K. K. Iya, Ph.D., Director of the Institute

This project represented a considerable modification of a "short-form" proposal entitled, "Protein distribution in milk and effect of storage of dried milk under tropical conditions on the protein components of milk," prepared by the institution under date of October 23, 1959, pursuant to Sam R. Hoover's visit to Karnal on that date.

During the only week that Mr. DeMoss and I could have visited Karnal, Dr. Iya was busy with conferences in New Delhi; accordingly, plans for negotiating this project were abandoned by direction of Mr. Marston. However, I was able to discuss the plan of work with Dr. Iya at a meeting in the Imperial Hotel, New Delhi, on December 3. He was accompanied on this occasion by Dr. S. N. Ray, Dairy Husbandry Officer of NDRI, and Dr. N. N. Dastur, head of the institution's Division of Dairy Education.

Dr. Iya accepted the plan of work of our project, without change in language.

It is recommended that Dr. Oman visit Karnal at his early convenience, to confirm Dr. Iya's acceptance of our plan of work and to conduct fiscal negotiations. The revised proposal to be prepared by him should of course be cleared through the Damle Committee in New Delhi.

During the discussions, Dr. Iya was advised of the status of several other proposals concerning the institution, as follows:

UR-A7-(60)-5
Studies of the isolation from microbiological organisms of milk-coagulating enzymes for use in cheese manufacture.
Status: Grant letter, addressed to K. R. Damle, Secretary of Agriculture, was signed by Mr. Marston on 7/15/60. (I later learned that Mr. Damle had concurred in the grant letter as of 11/25/60.)

UR-A7-(60)-g
Mineral balance in cow's milk.
Status: Dropped by Utilization Review Panel.

UR-A7-(60)-k
Heat stability of evaporated milk.
Status: This was a line of work for which Dr. Hoover had attempted to develop a proposal, in correspondence with Hugh L. Templeton, Dairy Technology Advisor to TCM at Calcutta. In his last letter to Dr. Templeton dated 11/9/60, Dr. Hoover indicated that a proposal would not go forward.

For background information on the Institute, Dr. Oman's attention is called to (1) the book, "Agricultural Research in India," pages 121-128 (available from ICAR in New Delhi); (2) Mr. Forbes' report of fiscal negotiations on UR-A7-(60)-5, dated 11/20/59; and (3) Dr. Hoover's report of technical negotiations on this project, prepared about 10/24/59.

Dr. Oman is being provided with the cleared but unsigned Approval Copy of Research Project UR-A7-(60)-11, as well as with the original "short-form" proposal and pertinent correspondence. Documentation is also being provided for the several other proposals mentioned above.